THE
BRITISH JOURNAL OF SURGERY

VOL. XXXVI APRIL, 1949 No. 144

SIR GORDON GORDON-TAYLOR

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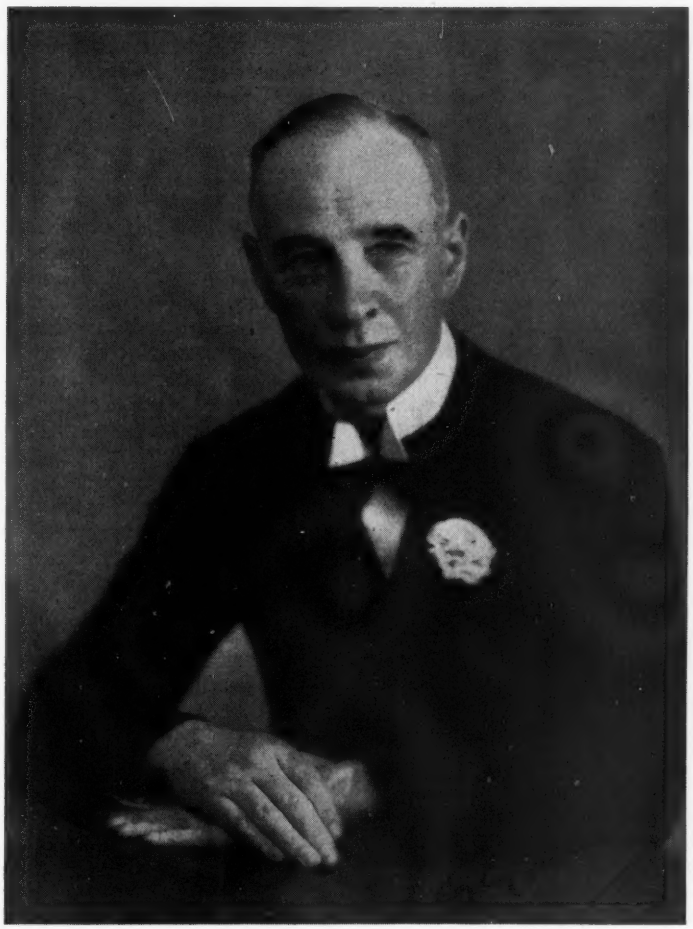

IT is given to few men to realize the esteem in which they are held by their fellows; the self-satisfied may be deceived by the respect accorded to their seniority or status, but the truly great are often insensible of the pride which others take in their achievements. Such a one is Gordon-Taylor, and this tribute is inspired by a desire to express the homage and affection in which he is held in the world of surgery.

Coming to London from Aberdeen as a classical M.A., he entered Middlesex Hospital as a scholar in 1898; scholarship and a rugged Scottish determination have continued to be outstanding facets of his character. Having qualified in 1903, he served as Demonstrator of Anatomy under Peter Thompson. In that year the University of London instituted the honours degree of B.Sc. in Anatomy; Gordon-Taylor and Victor Bonney were the first and only candidates, and, being both busy young men, they decided to work through the night three times a week. The long hours of dissection and reading in the old dissecting room were sustained by coffee essence heated over a Bunsen burner until at 5 a.m. they went across to the hospital for a cup of real coffee and some bread and butter. Their labours were rewarded by first class Honours in Anatomy and Morphology,

and they established a standard which few have emulated. The solid foundation of anatomy as a basis of surgery was thus laid.

After serving the offices of house surgeon and casualty surgical officer he obtained the M.S. and the F.R.C.S., and became R.M.O.; he was shortly elected Assistant Surgeon to Middlesex Hospital at the age of 29. The election committee of the day must have been men of great foresight, for every one of his seven competitors for the post has since attained high honours in surgery. His work brought him into association with Bland-Sutton, from whom he derived much inspiration.

During the first world war he served in the R.A.M.C., becoming Consulting Surgeon to the 4th Army after gaining a wide reputation as a casualty clearing surgeon. Some of his experience is epitomized in his book *The Abdominal Injuries of Warfare* (1939), a work which has given inspiration and encouragement to surgeons to be bold as well as judicious in treating war wounds and which laid the foundation of much of the successful surgery in the second conflict.

Returning to Middlesex after the war he became full Surgeon in 1920 on the retirement of Sir John Bland-Sutton. He had his own theatre next to his wards, Murray and Prudhoe, and did three full lists a week, including one on Saturday afternoon. His reputation as a surgeon of skill and courage attracted large numbers of visitors. He never spared himself, and operations went on to a late hour. The whole firm was imbued with the spirit of keenness which he engendered; nothing was too big for him, and much of the success of the present surgical attack on carcinoma of the œsophagus is due to his pioneer work. This applies to very many other surgical feats which are now almost commonplace, and his surgical courage and ardent desire for a real cure were expressed not only in abdominal surgery but in his successful development of the hindquarter amputation for the eradication of malignant disease around the hip. He has always been in the forefront of the surgical fight against cancer, but is in the true sense a general surgeon, skilled in every branch of the art.

A most generous chief, it was for many years his custom to present each new house surgeon with a cystoscope on his appointment and there are not a few urologists who owe their interest in the subject to this stimulus. Surgical visits, both to centres in Great Britain and the Continent, were part of the delight of working for him, and the party included registrar, anæsthetist, and house surgeon.

Nor was the social side forgotten, and his wife was always a most charming hostess. One of his chief forms of exercise was ballroom dancing, at which he was an adept, but for a holiday he was most fond of a few days' hard walking in the Scottish mountains; he rarely went far from a surgical centre, for his work is truly his hobby.

The outbreak of the second world war found him eager for service again and this time he entered the Royal Navy and was made Surgeon Rear-Admiral. His unrivalled opportunities for the study and treatment of war wounds both in service and civilian casualties were turned to good account; the results are embodied in the numerous lectures and papers which he has given on war injuries, and, whilst he himself is always the first to give the credit to the men who did the work, they form a lasting monument to his skill in direction and organization, and his surgical example.

In the Royal Navy his opportunities for travel were enhanced and he undertook numerous missions often involving many thousands of miles of travel by air or sea. There can be no country in the British Commonwealth which he has not visited and there are numerous others, to mention only Russia and Greece, to which his duties have taken him as an ambassador of goodwill, and which have been enriched by his presence. In 1945 he visited the British Pacific Fleet in Australia and it was not long before his usual charm and adaptability made him most popular. Whilst there he lectured in all the Australian capital cities and in many others far afield as well as in New Zealand, and he was everywhere royally received. His fame as a classical scholar, which was already known, increased more and more, and this is not surprising since one part of his heart has ever been in the classics; for light reading in aircraft he was often found to be engrossed in Horace!

He was appointed Consulting Surgeon to Middlesex Hospital on March 18, 1943, but continued active duties for a further three years; indeed his activities there have never ceased and there is no colleague who will not willingly give him beds when he wants them.

The surgical honours which have been showered upon him are too numerous to give in detail; he was Vice-President of the Royal College of Surgeons of England from 1941 to 1943, and has been President of the Association of Surgeons, the Royal Society of Medicine, and the Medical Society of London, and he has filled every office with that skill and courtesy which only he can command.

His recent illness, which found him in his old hospital as a surgical patient, caused profound disquiet to his friends in every part of the world and his successful recovery has brought a feeling of relief and thankfulness which is heartfelt. G.-T. is back in harness again, looking as fit and as young as ever; his first operation on his return was the ligature of an innominate aneurysm. Long may he prosper!

A SIMPLE EXPERIMENTAL METHOD OF EVALUATION FOR THE BASSINI AND ALLIED TYPES OF HERNIORRHAPHY

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TWENTY years ago Keynes (1927) expressed surprise that the problem of the operative treatment of herniæ had not been solved, and that the technique had not reached the point of final standardization. To-day the solution of the problem appears to be even more remote, and the number of operative methods has increased to such a degree that, for the present, final standardization has ceased to be a practical aim. In recent years surgical opinion has grown progressively dissatisfied with the results obtained in both types of inguinal hernia using the established operative techniques, and particularly with Bassini's method (Edwards, 1943; Lytle, 1945; Brandon, 1945 a, b; Mair, 1945, a; and others). For this latter procedure Mair (1945, b) quotes the opinion of a group of American surgeons that the average recurrence rate is 25 per cent, and states, in support of this criticism, that no less than seventy modifications of the original Bassini technique had been introduced to try and overcome its failures. Starting with Gallie and Le Mesurier (1924) as the first serious critics of all the older operative methods, new procedures have been devised by Wangensteen (1934), McVay (1942), Stein (1942), Neuhof (1942), Veal (1942), Scola (1944), Mair (1945, a), and by several others. The pathway leading to the solution of this surgical problem is largely composed, inevitably, of the assessment of the relative merits of these different techniques. To attempt such an evaluation is a salutory experience. Edwards (1943), in his critical survey of the subject, found that the published data contained so many variants and so many contradictions that the task was impossible; and gave the opinion that the only way out of this statistical quagmire was to reject the published figures in their entirety. For example the recurrence rate for indirect inguinal herniæ treated by Bassini's method ranges from 0·0 per cent (Hoguet, 1923) to 22·2 per cent (Page 1943); the results with Gallie's operation vary from 0·9 per cent (Burton, 1943) to 17·3 per cent for the indirect type, and 25·8 per cent for the direct type (Burdick, Higginbotham, and Gillespie, 1937); and even with skin-grafts there is a gap of several per cent (Mair, 1946; Marsden, 1948) already. If the statistical method of evaluation is to be rejected, it can be replaced only by reasoning based on anatomical observations and experimental tests. For example it will be recalled that several critics of the Bassini operation have asserted that the internal oblique and conjoined tendon do not remain attached to the inguinal ligament (Taylor, 1920; Seelig and Chouke, 1923; and others); and that Gallie and Le Mesurier (1924) questioned whether a sound union between these structures was achieved even in the successful clinical results. The following experimental method has been devised to test this very point and is applicable to all the techniques based upon the apposition of various structures in the inguinal and femoral regions.

A SIMPLE METHOD OF EXPERIMENTAL EVALUATION FOR THE BASSINI HERNIORRHAPHY AND ALLIED TYPES OF PROCEDURE

Probably the first writer to doubt that the Bassini technique achieved the sound union between the 'red muscle' of the 'conjoined tendon' and the 'white fascia' of the inguinal ligament, which was implicit in the method, was Kirschner (1910), who introduced fascial sutures to try and strengthen it. His example was followed by several surgeons. Some years later Gallie and Le Mesurier (1921, 1924), as the result of their observations upon failures following Bassini's operation, stated that "in every instance, the aponeurotic structures that had been sutured to the ligament had returned to their normal positions, leaving an area of weakness which the original operation had been designed to strengthen". Other observers (Edwards, 1943; Stein, 1946) reported that the conjoined tendon, although it had remained united to the inguinal ligament, had atrophied, and was unable, therefore, to exercise much control over the internal ring or the posterior wall of the canal. This atrophy is attributed to strangulation of the muscle-fibres by the sutures (Marinker, 1946), and to the fibrous degeneration which results because the muscle has to act obliquely to the direction of its fibres (MacGregor, 1930). A considerable amount of experimental work upon animals has been carried out in an attempt to discover whether a sound union occurs when red muscle is sutured to fascia, and, also, when fascia is sutured to fascia. Unfortunately the results are contradictory. According to Seelig (1927) and Seelig and Chooke (1923), the union between red muscle and fascia, even after scarification of the tissues, was by means of thin areolar tissue, and consequently unsound; and this view is supported by Roberts and Roberts (1925) and by MacGregor (1930). Gallie and Le Mesurier (1924) reached a similar conclusion with regard to the union between two sheets of fascia, and found that scarification, imbrication, and the use of non-absorbable sutures made very little difference. The opposite view, however, is held by Koontz (1926), Rosenblatt and Cooksey (1927), and Rosenblatt and Meyers (1928), all of whom obtained a sound union even with a considerable degree of tension present, provided all the areolar tissue was removed from the parts. This point of the tension necessary to appose the tissues has been suspected as a cause of failure since the time of Halstead, and several writers from Ferguson (1907) to Mair (1945, b) have pointed out that the anatomy of the insertion of the conjoined

tendon into the rectus sheath, in many cases, makes it impossible to appose that structure to the inguinal ligament in its medial part without considerable tension.

employing the following simple experimental procedure. At the time of operation silver wire markers are inserted through the curved lower border of the conjoined tendon and through the sharp inner edge

Table I.—X-RAY RESULTS IN CASES WITH "MARKERS" INSERTED

PATIENT	AGE	TYPE OF HERNIA	TYPE OF OPERATION	X-RAY			
				Post-operative	3 months	6 months	9 months
1. A.S.	17	R. indirect inguinal	Bassini	In apposition	Definite spread		
2. D. W.	27	L. indirect inguinal	Bassini	In apposition	In apposition	In apposition	
3. A. F.	64	R. indirect inguinal	Bassini	In apposition	Definite spread		
4. A. R.	31	R. indirect inguinal	Bassini	In apposition	Definite spread		
5. A. A.	20	R. indirect inguinal	Bassini	In apposition	Definite spread	Further spread	No change
6. W. M.	49	R. indirect inguinal	Bassini	In apposition	In apposition	Definite spread	
7. M. H.	54	L. indirect inguinal	Bassini	In apposition	In apposition	Definite spread	
8. P. McH.	46	R. indirect inguinal	Bassini	In apposition	In apposition		
9. S. E.	48	L. indirect inguinal	Bassini	In apposition	In apposition	In apposition	
10. C.T.V.	57	L. indirect inguinal	Bassini	In apposition	Definite spread		
11. V. L.	35	R. femoral	Lötheissen–McVay	In apposition	In apposition	In apposition	
12. J. B. R.	37	R. femoral	Lötheissen–McVay	In apposition	In apposition	In apposition	
13. W. W.	37	R. femoral	Lötheissen–McVay	In apposition	Definite spread	Further spread	Further spread

Although in part conflicting, this experimental and anatomical evidence is suggestive that the older herniorrhaphy techniques are probably unsound; but none of these studies attempt to answer the

of the inguinal ligament and tied so as to minimize the chance of their cutting out. In the short series of tests recorded in *Table I* the Bassini technique was employed, using catgut sutures, care being

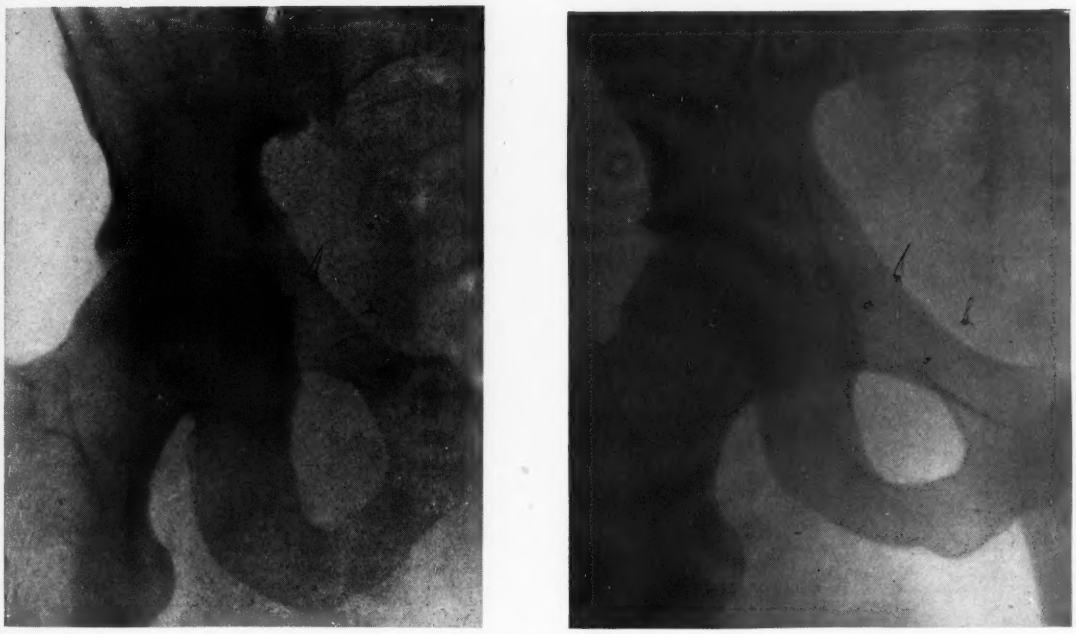
A B

FIG. 474.—A, Radiograph after three months, markers in apposition; B, After six months, markers still in apposition.

crucial question put by Gallie and Le Mesurier (1924) as to whether, in those cases which were free from recurrence, a sound union had occurred between the conjoined tendon and the inguinal ligament. This question can be answered, however, by

taken to appose the curved lower edge of the conjoined tendon to the inguinal ligament without the interposition of areolar tissue or of strands of the cremaster. The transversalis fascia was repaired, and, if required on account of tension, an incision

was made into the rectus sheath. It is of interest to note that in the great majority the tests showed that the conjoined tendon had separated from the inguinal ligament within a few months, although no recurrence has yet occurred. None of the radiographs suggest that any of the silver markers have become loose, as those in the inguinal ligament do not appear to have moved at all, whilst those in the conjoined tendon only show displacement in one plane, upwards. Unquestionably, therefore, this simple test



A B

FIG. 475.—A, Radiograph after three months, showing separation of markers; B, After six months, showing still further spread of markers.

is capable of giving a definite answer to the query put by Gallie and Le Mesurier. *Fig.* 474 A, B are radiographs of a case in which the conjoined tendon has remained in apposition with the inguinal ligament; *Fig.* 475 A, B of one in which those structures have become separated. Clinically these two cases are equally successful up to the present time. As an example of the application of the test to a different operation, *Fig.* 476 A, B, C are of a case in which the conjoined tendon was sutured, with catgut, to Cooper's ligament; it suggests that the edge of the conjoined tendon has torn between the inner and middle marker, allowing the most medial part of the tendon to recover its original position, whilst leaving the two outer markers still in apposition with Cooper's ligament. It will be noted that the outer tail of the knot on the upper and inner marker in the conjoined tendon has been bent downwards and inwards during the process.

Obviously this experimental test is of use, because it can reveal the failure of the herniorrhaphy when the clinical result is successful. Conversely a recurrence might occur through an atrophied conjoined tendon whose lower border had remained soundly united to the inguinal ligament. The full evaluation of herniorrhaphies of this type, therefore, needs the combination of the experimental with the statistical method of assessment.

THE DIFFICULTY OF STATISTICAL ASSESSMENT

The employment of this method in the past, however, has not produced clarification of the problems, but has resulted in the conflicting and contradictory mass of data which so dismayed Edwards (1943). The main difficulty, as this authority noted, arose from the large number of variable factors, such as the criteria of a 'recurrence', which could influence the results published by different writers. There is, indeed, another problem of a different kind inherent in the statistical method, arising from the fact that the investigator can never possess all the evidence relating to his study, but has to draw his conclusions from a series of samples taken from the larger whole and base his inferences upon these incomplete data. In other words, he has to perform the logically forbidden step of arguing from the particular to the general. Fortunately science has discovered the way in which both these difficulties can be overcome in practice.

***a.* The Problem of Numerous Variables.**—The development of this aspect of the statistical method has been closely connected with biology and its practical application in agriculture. Briefly, it was found that soil fertility varied so much, even in small areas, that the yield of a poor seed in good soil might be better than that of a good seed in poor soil. This statement, of course, is a gross oversimplification. This difficulty might be overcome if the tests were made exactly alike in every respect except for the particular point under investigation. The well-known authority Fisher (1947) points out, however, that this method is fallacious, because it implies that the investigator knows *all* the disturbing factors, and controls each one; whereas in biological problems some of the factors influencing the results

are frequently unknown, and therefore cannot be controlled. Moreover two factors may be influential acting together, but innocuous on their own. Fisher (1947) then proceeds to describe a more reliable method, which admits frankly the impossibility of making the tests identical save for a particular factor. The essence of Fisher's method is that the various tests (types of seed, or fertilizer, for example) should be distributed at random over a specified piece of ground so that each particular test would have an equal chance of landing on a patch of good soil of more than average fertility. By this arrangement the relationship between the various tests and the unknown factors of soil and atmosphere that can influence the result is one of chance. (In surgery the patient is analogous with the soil, and the operative procedure with the seed.) The next step is to assume that the various types of seed (or operation), for example, are all of equal value; from which it follows that the observed variations in the results would be due solely to the action of the unknown factors. Therefore the observed variations must be distributed according to chance, because that is the relationship between the causative factors and the tests imposed by the method.

A

B

C

FIG. 476.—A, Lötheissen–McVay. Markers in apposition at three months. B, Radiograph showing upward displacement of inner marker on the conjoined tendon. C, Radiograph after nine months, showing further displacement of the inner marker on the conjoined tendon.

Fisher (1947) points out that these variations would conform to a known theoretical distribution (the normal law of the frequency of error). If, in fact, the variations which actually occur do conform to this theoretical distribution, the assumption that all the seeds (or operative techniques) are of equal value is confirmed; if, however, they do not do so, the seeds (or operations) cannot be of the same value. Fisher concludes by asserting that this method takes care of all the unforeseen causes influencing the issue at stake, and relieves the observer from the anxiety of trying to assess the magnitude of innumerable intercurrent factors. Its applicability to the relative evaluation of different herniorrhaphies is obvious.

***b.* The Problem of Samples.**—Fisher (1946, 1947) states that it is possible to obtain some idea of the infinite hypothetical 'population' from which samples have been drawn if it is realized that the characters of that 'population' are distributed in a definite pattern of frequencies. This idea is fundamental to all statistical work. This authority defines a 'statistic' as a value calculated from observed samples with a view to characterizing the 'population' from which they have been drawn. Obviously, because the characters of the 'population' vary in their frequency, this 'statistic' will tend to vary from sample to sample. It will be seen, however, that if the entire 'population' was

split up into ' samples ', then, inevitably, the variability between the different samples must correspond exactly with the frequency distribution of the ' population ' as a whole. In spite of the fact that the frequency distribution of a particular sample has a definite relationship to the frequency distribution of the ' population ', it is a matter of great mathematical difficulty to calculate the latter from the former. It is plain, however, that the larger the sample is made the more it must approximate to the character of the ' population ' from which it is drawn; hypothetically, if the ' sample ' were to absorb almost the entire ' population ', their characteristics would be almost identical. In practice, therefore, it is customary to apply what is called "the theory of large samples", because in such samples the ' statistics ' calculated from them tend to assume the same pattern as that of the ' population '. It should be noted at once that small ' samples ', unless they are used for a particular purpose and given special mathematical treatment, are liable to lead to gross error. For most practical purposes it is assumed that the frequencies of a character in the ' population ' have a ' normal ' distribution, which is symmetrical in form with its greatest frequency at the centre and each other frequency related to it by a definite mathematical law. If, therefore, a series of large samples is taken from this population at random, and this is an essential condition, the divergence of the frequency distributions relative to the ' normal ' distribution of the ' population ' can be calculated. The variation between the samples is due to their random selection, but as large samples tend to have ' normal ' distributions, the accuracy of any one such estimate may be satisfactorily expressed by its ' standard error '. Therefore valid conclusions regarding the character of an infinite ' population ' can be drawn from samples, provided that they are sufficiently large in size, and the degree of error estimated. The importance of this principle for surgery is self-evident because no follow-up system is perfect and the results of many cases are unknown; and even if it was perfect it would still only be a ' sample ' of a larger whole. Last, it should be noted that some of the most widely divergent recurrence rates for herniorrhaphy are in series of less than 100 cases, and in some instances of less than 50 cases.

c. **Tests of Significance.**—It may happen, however, that a sample is taken which has a frequency distribution that does not fit in with the others or with the distribution of the ' population ' that they represent. In this case, according to Fisher (1946), the conclusion is that this aberrant sample has been drawn from a different ' population '; a ' population ' which, for example, has been subjected to a form of treatment which has made a material difference. The importance of this point is obvious. In practice a difference is accepted as ' significant ' if its value exceeds twice the standard deviation. This is an arbitrary decision, and means that such a deviation would only occur by chance once in twenty-two trials. Any description of the methods of calculating ' significance ' is beyond the scope of this paper. A good example, in the surgical literature, of a ' significant ' aberrant sample which obviously has been drawn from a different ' population ', is provided by the results achieved with the Bassini technique by Bull and Coley (1907), Hoguet and Coley (1918), Hoguet (1923), and Coley (1924).

These writers gave the results of several thousand operations, with a recurrence rate varying from 0·0 per cent to 0·5 per cent. Their material, however, consisted almost entirely of children up to 15 years of age. Similarly, another large series

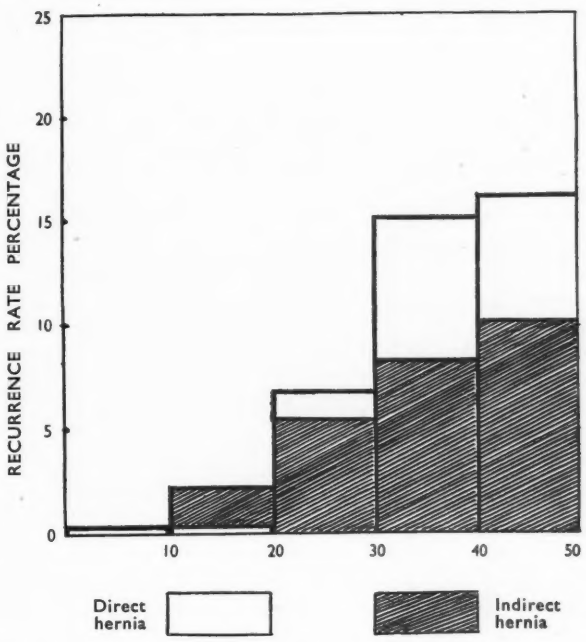


FIG. 477.—Shelley's data. Relationship of age to rate of recurrence.

reported by Grace and Johnston (1937) with a rate of recurrence of 21 per cent for indirect hernia and 32 per cent for the direct type, was made up of patients all of whom were over 50 years of age. This influence of the age factor is supported by the data published by Shelley (1940, a, b) and summarized in *Fig.* 477.

d.—**Practical Application in Surgery.**—To achieve an absolute figure for the recurrence rate with the Bassini or any other technique would be a

Table II.—TIME OF RECURRENCE IN 1308 CASES

AUTHOR	NUMBER OF CASES	PERCENTAGE RECURRENCE AFTER 2 YR.
Fallis, 1937	200	52
Block, quoted by Page, 1934	626	35
Burdick and others, 1937	284	40
Shelley, 1940, indirect	120	33
Shelley, 1940, direct	68	33
TOTAL	1298	

difficult and tedious procedure. The length of the follow-up would have to be lifelong, for example, because some recurrences are delayed for many years. This point is emphasized by *Fig.* 478

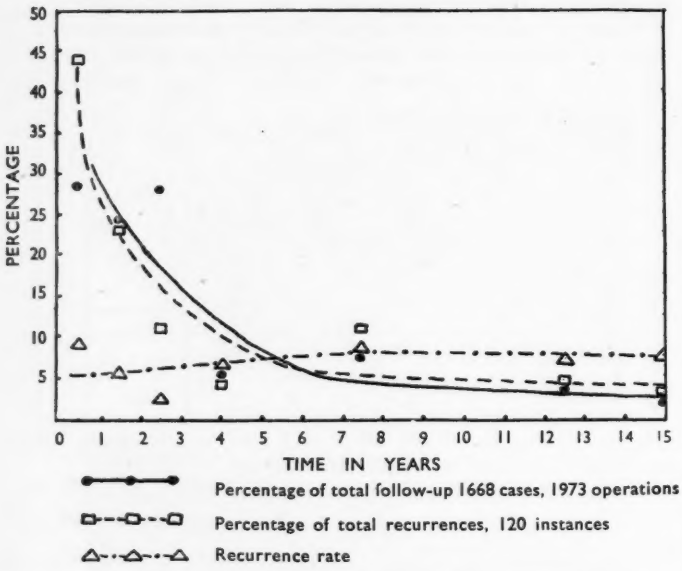


FIG. 478.—Shelley's data. Graph showing the relationship between the efficiency of the follow-up and the number of recurrences detected; and the rate of recurrence over 15 years.

(Shelley's data), and also by *Table II* which shows that in 1298 cases of recurrence a considerable proportion only developed after 2 years. Moreover a problem of this type which divides the material into only two classes, ' successes ' and ' recurrences ', introduces a mathematical difficulty; because, obviously, it does not form the essential curve of distribution. This could be overcome by manipulating the data into a series of ' samples ', each containing an equal number of cases but in which the number of ' recurrences ' would, of course, vary, thus enabling a curve to be constructed. What the surgeon wishes to know, however, is which operation is the best rather than the absolute recurrence rate of each, and that question could be answered easily by performing a planned experiment of the type described by Fisher (1947) covering a set period of time.

CONCLUSIONS

1. That the full evaluation of the Bassini and of other types of herniorrhaphy requires a combination of experimental and statistical tests.

2. That the adoption of the simple experimental method described herein may prove that the Bassini technique and those others which rely on the apposition of the structures of the inguinal and femoral regions, are fundamentally unsound.

3. That the widely divergent and conflicting opinions which are held about the relative values of different operative techniques are due, largely, to the fallacious manner of the compilation and analysis of the clinical material upon which those opinions are based.

4. That an accurate statistical evaluation of the various types of herniorrhaphy would require a properly planned investigation on the lines laid down by Fisher for the solution of biological problems in which innumerable factors, some unknown, influence the observed results.

SUMMARY

1. The conflict of surgical opinion about the best operative technique for the repair of inguinal herniæ is noted and the wide divergence in the published recurrence rates is referred to.

2. It is pointed out that no direct evidence exists to show that in successful clinical results the parts have remained soundly united and in apposition.

3. A simple experimental method is described designed to test the above point, and a series is recorded which demonstrates that in the Bassini technique, and in the Cooper's ligament operation, there is a tendency for the parts to separate and return to their pre-operative position within a year.

4. The opinion is given that for the full evaluation of any particular type of operation a combination of experimental and statistical methods are needed.

5. The difficulties of an efficient statistical investigation are discussed, and the main sources of error noted. The conclusion is reached that the conflict of surgical opinion is due mainly to the misleading nature of current statistical methods.

We wish to thank Mr. R. L. Newell, Honorary Surgeon to the Manchester Royal Infirmary, for his advice and encouragement; Mr. W. F. Nicholson, Assistant Surgeon to the Infirmary, for his help in the preparation of the paper, and Dr. G. L. Camm, of the Department of Mathematics, Manchester University, for his help with the statistical sections of the paper. Also, we wish to thank Mr. Kilshaw, of the Department of Clinical Photography, for the reproductions of the X-ray films.

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THE TREATMENT OF CAVERNOUS HÆMANGIOMAS AND CIRSOID ANEURYSMS BY THE INJECTION OF BOILING WATER

By the late PERCIVAL P. COLE, O.B.E., and ALAN H. HUNT, London

A certain confusion exists concerning the treatment of angiomas. Most publications dealing with the subject list the various available methods without giving a clear indication of their applicability to the different types of tumour. Indeed, it is common knowledge that a number of hæmangiomas present in infancy disappear spontaneously with the growth of the child, and any form of treatment applied to these tumours will produce gratifying but misleading results.

Experience in dealing with a large number of angiomas by almost every form of treatment has taught us that there are many methods which are usually effective in the treatment of the superficial intradermal capillary types of blood-vessel tumour, of which the 'port-wine stains' and 'strawberry birth-marks' are the most important examples. Thus, the capillary nævi can be caused to diminish in size or disappear by treatment with CO_2 snow, electrocoagulation, or irradiation with X rays or radium. These methods are, as a rule, ineffective in dealing with the deeper subcutaneous cavernous angiomas and cirsoid aneurysms. They are not only ineffective, but must be avoided because the preservation undamaged of the cutaneous covering of the tumour is of vital importance. Loss of viability in the superficial tissues due to radium and X rays may lead to sloughing, infection, and hæmorrhage, with serious risk of grave consequences (e.g., *Fig.* 479 A.)

The useful methods of treating cavernous angiomas are surgical excision, ligation of the feeding vessels, the injection of chemical sclerosants, and coagulation and sclerosis by the injection of boiling water (Wyeth's method).

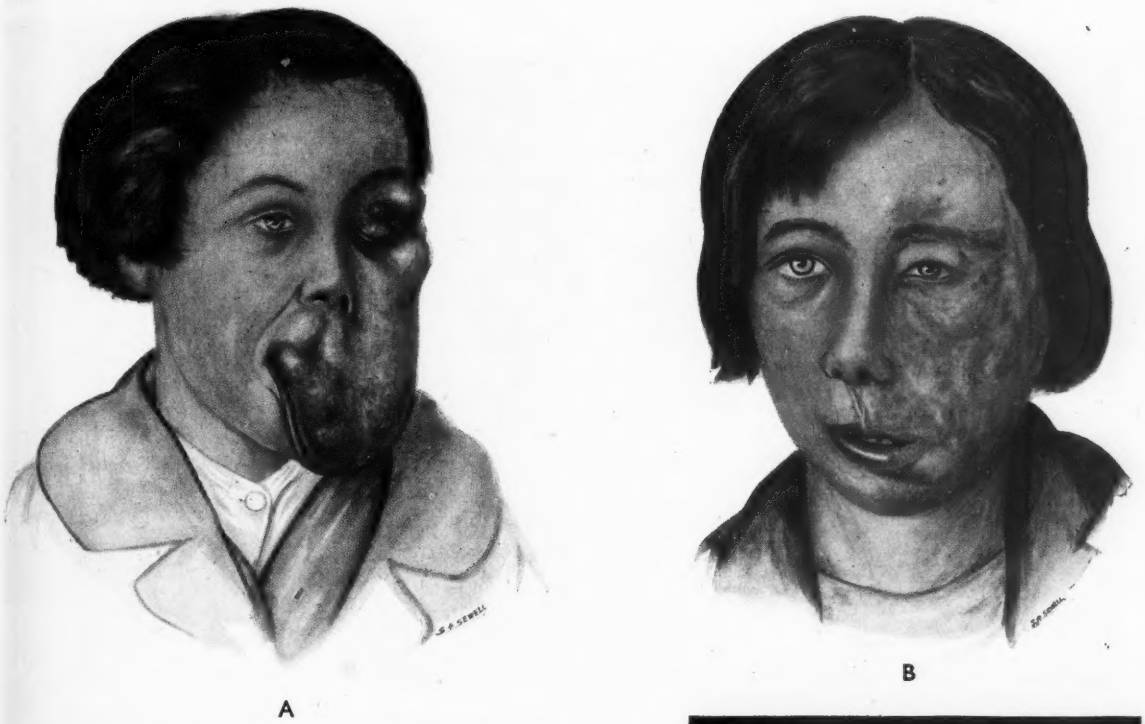
Surgical excision should be restricted to those tumours that are easily accessible and well localized, and where a linear scar may be anticipated. (Certain wide excisions with subsequent plastic repair may be necessary in those cases where a cavernous hæmangioma is associated with an extensive pigmented nævus, but these rare cases come outside the scope of the present article.) Excision is often impossible on account of the situation and extent of the tumour (e.g., *Figs.* 480, 481 A) or undesirable if a simpler effective method is available.

Ligature of the vessels feeding an angioma, never necessary in the absence of pulsation, is often of value as an adjuvant to sclerosis (e.g., *Fig.* 481 B). Ligation itself will not cure the growth (e.g., *Fig.* 480 A, 481 A). It is necessary to remember that the vessels feeding a hæmangioma arise from the blood-supply to the part concerned, but the blood they supply passes through the tumour as a circulation entirely independent of that of the adjacent tissues. This apparently applies even to those angiomas which are diffuse and invasive in their appearance. When the tumour is a cirsoid aneurysm, the shunt of blood will be so considerable that the quantity available for nourishing the unaffected tissues will be reduced. Restoration of correct nutrition to the surrounding tissues is not brought about by ligating the main vessels to the part. We have seen the acute development of ulcers of the palate and tongue following ligation of the external carotid artery for cirsoid aneurysm of the face and neck (e.g., *Fig.* 481 C, D), and in the absence of any other aetiological factor we were driven to the conclusion that these ulcers were due to local ischæmia. Our only failure was an extensive cirsoid aneurysm of a hand which had to be amputated on account of persistent ulceration following ligation of the feeding vessels. The index, middle, and ring fingers had been amputated before the patient was referred to us.

A B

Fig. 479.—A, Cirsoid aneurysm of upper lip, patient aged 42, after treatment over 15 years by radium applicators and ligation of both facial arteries. Ulceration and hæmorrhage had lead to gross anæmia. (Hb 30 per cent.) B, Two months after beginning a course of boiling-water injections. (Hb 90 per cent.)

The injection of chemical sclerosants into the blood spaces of these tumours has given good results in certain published series of cases. Peyton and



A B C

FIG. 480.—A, Extensive cavernous hæmangioma left side of face, aged 13. Treatment with boiling-water injections begun. B, Condition aged 16. (A new upper eyelid has been made.) C, Condition aged 35. To show recrudescences prior to further treatment with boiling-water injections.

Leven (1938) cured 80 per cent of a group of hæmangiomas considered suitable for this form of treatment. We have not been able to obtain the same good results by this method, in spite of injecting the chemical sclerosant with the blood spaces empty and maintaining compression on the tumours for four days after the injections. A study of the report suggests that many of our cases are more severe than the majority of those published. Some have been sent to us when other possibly applicable methods have been tried and failed elsewhere. We have found that, in those of our cases where chemical sclerosants have failed, subsequent injection of boiling water has given immediate and satisfactory results.

Coagulation and sclerosis by the injection of boiling water is not a new method. It was introduced by Wyeth in 1903. He used it with success in the treatment of all types of angiomas, including the capillary nævi. We have restricted its use to the deeper cavernous angiomas which are the more difficult to treat. It has proved most adaptable and effective in cases where all other methods have failed. It has received little publicity and we know of few surgeons who practise it because it is a method that requires a special syringe. Reder (1915) describes the technique accurately and gives a most favourable account of his results. Otherwise there is little mention of the method in surgical literature except such statements that boiling water "has no advantages over other sclerosing solutions and is difficult to handle" (S. Formon, 1939). Blair and Ivy (1944) state that "many blood-vessel tumours have been destroyed by the injection of irritating substances into them, but with the exception of boiling water in the large diffuse cavernous angiomata, the injection treatment is to be condemned on account of both sloughing and embolism". They, like most writers who mention the method, give no details, and advise ligation of vessels, acupuncture, and excision. Before the method is thus passed over by these and

other distinguished authors, we feel that notice should have been taken of Wyeth's original instructions, that " the water should be hot enough immediately to coagulate the blood and albuminoids of the tissues,

Systematic attempts to extend the scope of boiling water following its use at Great Ormond Street were undertaken by one of us (P. P. C.) at Queen Mary's Hospital and the Royal Cancer Hospital in the years

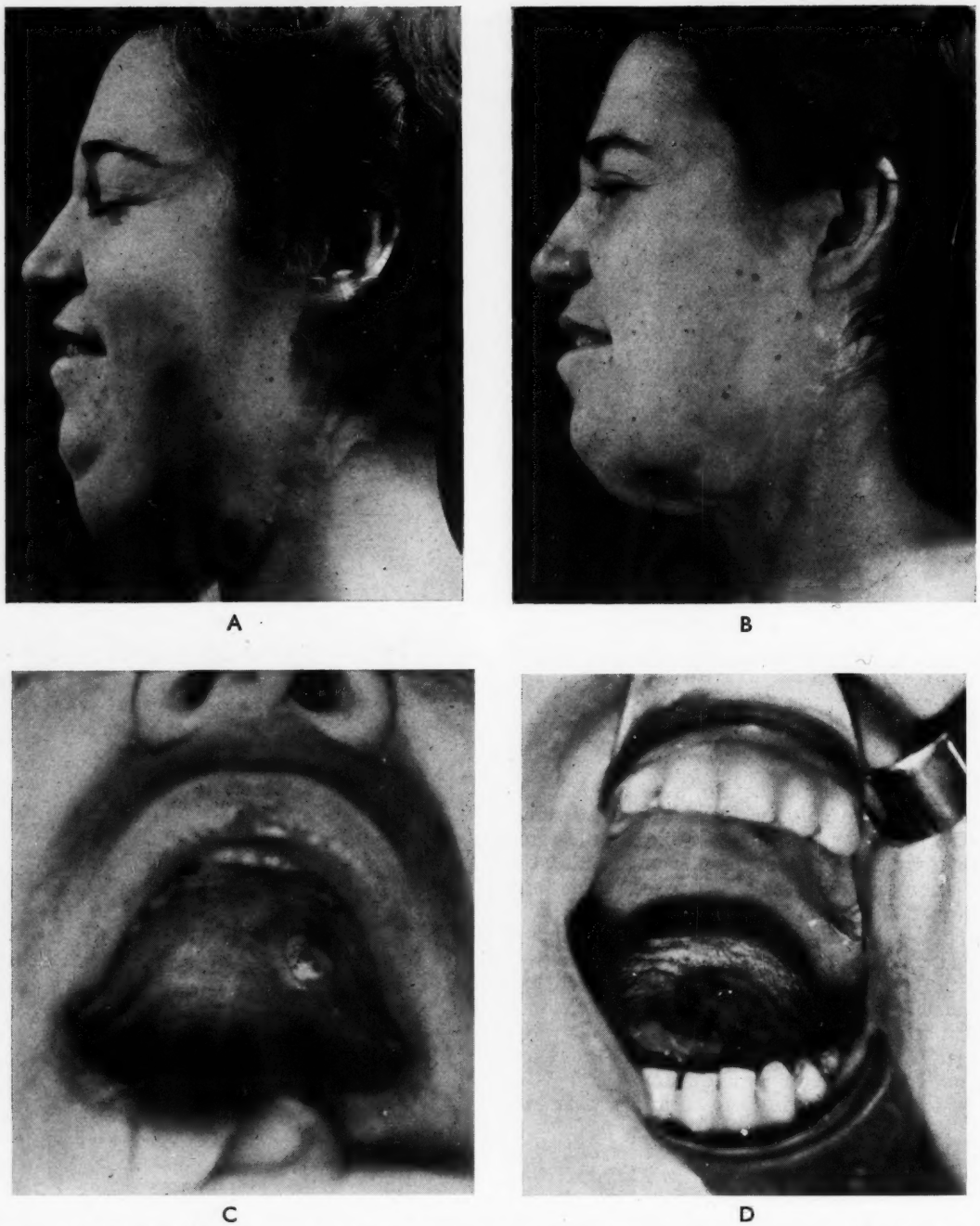


FIG. 481.—A, Extensive cirsoid aneurysm of the neck, extending from mastoid process to mastoid process. Patient aged 23. Scar of previous attempts at operation shown. B, 18 months later, during a protracted course of boiling-water injections and after ligature of both external carotid arteries. (There was an interval of two months between the arterial ligations.) C, Ischæmic ulcer of palate. D, Ischæmic ulcer of tongue following the second external carotid ligation.

but should not be forced in so extremely hot and under such pressure as to scald and produce necrosis of skin". We have accidently produced minor degrees of necrosis in a few cases, but none that caused us concern, and we have encountered no case of embolism.

immediately following the first world war. Cases were carefully observed and followed up with a view to establishing the safety, reliability, and permanence of this method in the treatment of all varieties of hæmangioma, particularly those of the cavernous type and the cirsoid aneurysms. The extent and

site of the tumours treated has varied greatly. In some of the cases with extensive tumours, previous attempts at treatment had been made, e.g., *Figs.* 479, 481, and 483, but in others the condition had been allowed to proceed without interference for lack, presumably, of a reliable method of coping with it.

Based on the experience of twenty-five years of one of us, and of a joint association of some eight years, we summarize the considerations pertinent to the application of the method in practice, illustrated by appropriate cases.

A B C

FIG. 482.—A, Extensive cavernous hæmangioma, right side of face, aged 10. Treatment with boiling-water injections commenced. B, Recrudescence in upper lip, aged 17. C, Aged 18, after further injections.

A B

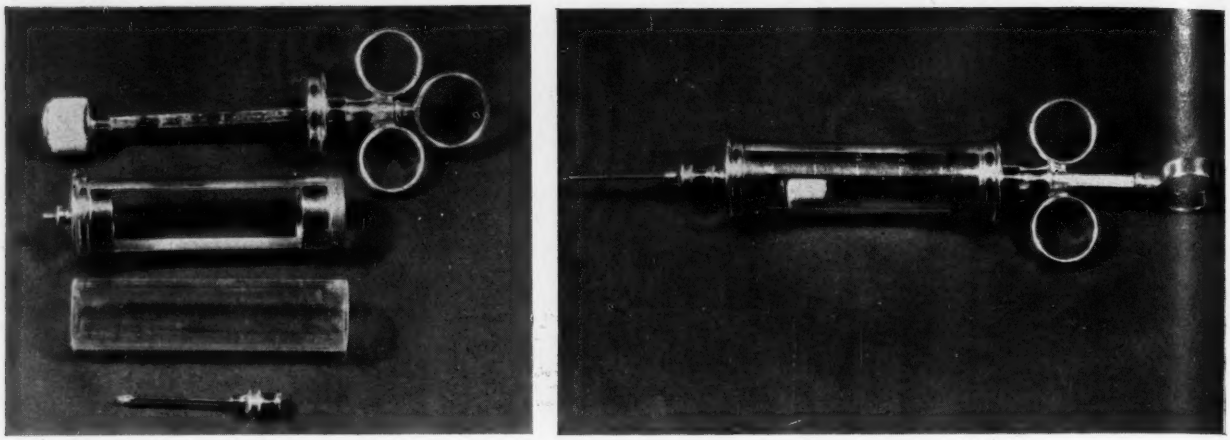
FIG. 483.—A, Cavernous hæmangioma of face after unsuccessful treatment with diathermy, electrolysis, CO_2-snow, and radium. B, After course of injections of boiling water, done over a period of 2½ years. Previous cutaneous damage remains.

THE TECHNIQUE AND PURPOSE OF BOILING-WATER INJECTIONS

1. The Syringe.—The syringe used in treating the cases illustrated in this article was made for one

of us (P. P. C.) by Allen & Hanburys in 1923. It consists of a ' pyrex ' glass barrel mounted in a metal casing into which it is fixed by a threaded cap carrying the washers at finger grips (*Fig.* 484). Rubber both ends makes it leak-proof. The plunger consists

The syringe is filled with boiling water and the previously assembled and sterilized needle and adaptor (within the piece of catheter) are fitted on. It is thus very quickly filled and put together ready for the injection.



A B

FIG. 484.—Cole's syringe.

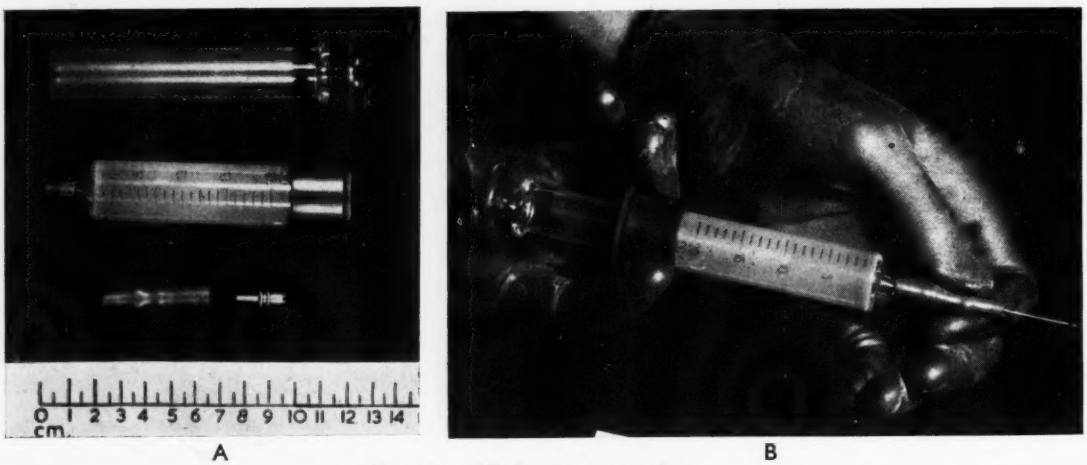
of a washer made of wound asbestos which is well lubricated with sterile vaseline petroleum jelly before use. The shaft of the plunger is threaded on to the metal disks enclosing the asbestos, which can thus be screwed up and compressed to produce a perfect fit in the barrel. The needles screw on to the syringe casing, the junction again being water-proofed with a rubber washer.

An alternative and simpler syringe which we use (on account of the fact that Cole's syringe is not at present available) is illustrated in *Fig.* 485. It consists of a ' pyrex ' all-glass 20-c.c. syringe with a Record-type metal needle adaptor, supplied by the

The method of holding the syringe is illustrated to show how considerable pressure can be exerted on the plunger without risk of blowing off the needle and scalding the patient. The needle is held firmly in place during the injection, but one needs to exercise greater care than when using a Cole's syringe, which is fool-proof.

In either case, needles of sizes 18 or 19 B.W.G. are generally used.

2. Nature of the Fluid for Injection.—This has been ordinary tap water free from any kind of preparation and without the addition of any auxiliary sclerosing substance.



A B

FIG. 485.—All-glass ' pyrex ' syringe.

Genito-Urinary Manufacturing Co. The butt end of a rubber catheter of suitable size is threaded over needle and adaptor. This rubber covering to the metal parts gives an excellent insulation from the heat and produces a leak-proof junction. A second insulated grip around the near end of the barrel is provided by a short segment of a rubber tube of large bore.

3. Temperature of the Fluid.—The fluid should reach the tissues at a temperature as near to boiling-point as possible. To this end patient, anæsthetist, operator, syringe, and source of boiling water should be arranged to allow quick transfer from the reservoir to the affected tissues.

The operator is protected by the use of thick heavy gloves, or by two pairs of ordinary operating gloves.

The boiling-point of water can be raised by the addition, in graduated quantities, of such a harmless substance as common salt. The potentiality of this theoretically attractive development has been tested, and we are emphatic in our condemnation of it. If the solution is allowed to boil away the salt becomes concentrated and a gross inaccuracy is introduced which may have serious consequences. Moreover, the trials have failed to demonstrate any material benefit within the range of temperatures explored.

4. Anæsthetic.—The choice of this is partly determined by the site involved, but during recent years intravenous pentothal has been almost universally employed.

5. Preparation of the Site of the Tumour.—No skin preparation prior to the administration of the anæsthetic is necessary. The skin must be of its natural colour so that the slightest change can be observed. The site involved is isolated by sterile towels reinforced with cotton-wool packing to obliterate hollows, to plug the ear, and so forth. The skin is freely smeared with sterile vaseline petroleum jelly. All aseptic precautions are taken with the materials and instruments used.

6. Site of Puncture.—In general the needle will be inserted into the tumour mass, but obvious areas of very thinned-out skin should be avoided, and in localized tumours where the whole surface is thinned and particularly where pulsation is present, puncture should be made at the margin where tumour tissue merges into normal skin. Puncture by way of mucous membrane surface is not recommended, but can be, and sometimes must be, resorted to at such sites as the lips and cheek.

7. Amount Injected.—This will vary with the size and consistency of the tumour mass. The more compressible the area the more readily will fluid be injected and, within reason, in larger quantity. In this connexion it must be remembered that even in large, compressible hæmangiomatous masses the injected fluid does not become distributed throughout the whole tumour but tends to remain localized. A number of punctures, therefore, may be required to secure a comprehensive effect and these punctures can sometimes be undertaken at the same sitting. Amounts varying from a few minims up to 75 c.c. have been injected on a single occasion. The crucial tests of tolerable injection are provided by feel and sight. Using Cole's syringe it is possible to have one hand completely free for the purpose of palpation. A brilliant well-focused light should be available to enable appearances to be checked. It is of fundamental importance to avoid blanching of the skin. The amount of force required varies greatly and is again dependent on the tissue constitution of the tumour. Further injection should be witheld in the presence of quick and rapid distension, or when the tissues undergo a squirming contracture, as they may in the vicinity of the lips.

8. The Effects of Injection.—The boiling water can be injected into the blood spaces of the tumour or into the loose connective tissue between these spaces. The object is to produce a threefold effect: (*a*) Intravascular thermal coagulation; (*b*) Scalding and destruction of the intima of the blood spaces; and (*c*) Perivascular inflammation progressing to fibrosis. In our opinion destruction of the intima of the blood spaces (with subsequent compression of the tumour if possible) and the perivascular fibrosis, both brought about by extravascular injection, are more effective than injection into the blood spaces. However, the important point is that the injection should be done as rapidly as possible, bearing in mind that if the point of the needle is in a blood space water almost at boiling-point together with clots may escape into the general circulation, with the possibility of embolus formation. Should this intravascular injection occur, the tumour will not swell with the injection as it does when the boiling water remains between the blood spaces. The formation of phleboliths, sometimes observed, is an interesting phenomenon associated with and indicative of thrombosis of the venous channels and obliteration of their lumina. In one case their size caused obvious disfigurement. However, the planned removal of these phleboliths was rendered unnecessary by their spontaneous disappearance.

9. Bleeding.—There may be quite smart bleeding from the needle punctures, particularly in the case of very easily compressible tumours, but this quickly yields to pressure and nothing further than gauze smeared with sterile vaseline petroleum jelly and held in position by a bandage is necessary in the way of dressing.

10. Pain.—In this connexion the most arresting feature is its complete absence and this in spite of the fact that—

11. Tissue Reaction may be so great as to be frightening to the uninitiated. In the region of the eyes this may affect the lids so that the eye is obscured unless the lids are retracted for inspection. In a large number of cases affecting this area of the face no untoward result has been recorded in the way of damage to eye or eyesight. The reactionary swelling rapidly subsides and in the most severe cases the normal contour is re-established within about ten days.

12. Interval between Injections.—This will vary with the conditions in the individual case, but as a general rule with a well-planned and distributed attack further injections need not be considered for ten to twelve weeks, though sometimes weekly injections have been necessary in resistant cases. It happens often enough that the reaction is not homogeneous and that an area previously dealt with will need further injection. Usually subsequent injections are so placed within the tumour that the area of coagulation to be obtained builds up on fibrosis previously produced. As is indicated in the case notes, this policy of watching and opportunist intervention may last for a long time in the initial treatment. Another factor that must be constantly kept in mind is the tendency of these tumours to present from time to time what can only be called local recurrences. This form of recrudescence is particularly liable to occur where there is extensive involvement of the mucous membrane of the lips, cheek, or palate, and it is for this reason that cases should be regularly seen at intervals of a few months over a period of years (*Figs.* 480 C, 482 B).

13. Dangers.—

a. Embolism.—Towards this possible outcome a lively fear has naturally been entertained. Complete

confidence has gradually been attained, for embolism has never been experienced in our cases, although injections have been made in areas particularly favourable for such an occurrence. Reference to the scanty literature indicates that fear of this untoward outcome has been such as to lead to the employment of compressive measures which could not possibly have been an efficient preventive.

b. Secondary Hæmorrhage.—This has been noted on one or two occasions and particularly in the case of a pulsating tumour of the lip in which tissue destruction occurred at the site of the needle puncture. It is with this complication in view that the warning to avoid surface destruction has been emphasized. Injections deeply into or far out of range in mucous surfaces have been avoided.

c. Accidental Scalding of Skin or Neighbouring Tissues by leakage or inadvertant release of boiling water as the needle is inserted or withdrawn is a danger which must always be borne in mind and warded against by free lubrication with vaseline petroleum jelly, and the protection with wool or special apparatus of such structures as the ear and the eye. For example, we use a moulded perspex spatula-shaped shield for the protection of the eye in injecting angiomas of the eyelids.

d. Scarring.—Cutaneous destruction will give rise to some scarring at the site of the lost tissue, and some slight distortion may occur by irregular contraction of the coagulated mass. The skin over the area treated by boiling water may not be without blemish, but in this connexion one cannot avoid comparison with other methods which in many instances have been unsuccessfully used before the cases have come under notice. An outstanding example is that of the case shown in *Fig.* 483, in which the skin has been permanently damaged and deformed by the use in turn of diathermy, electrolysis, CO_2 snow and radium. It will be seen that the gross deformity attributable to swelling has been creditably diminished by the boiling-water injection, but the changes in the skin are a permanent aftermath of previously misapplied methods.

e. Infection.—There is a risk of superadded infection in cases of angiomas of the mouth where the teeth are infected. All precautions are taken to minimize such infection, including the administration of penicillin locally and systemically.

SUMMARY

Matters pertinent to the treatment of cavernous hæmangiomas and cirsoid aneurysms by the injection of boiling water (Wyeth's method) are discussed, and the technique is described.

A perfect result can rarely be obtained in these cases, but illustrations are presented to show that the injection of boiling water produces a most creditable improvement, sometimes where no other method is feasible. Properly applied, the method is safe and relatively painless. Smaller tumours can be rapidly disposed of. Larger tumours require a number of injections over a period of months. Cases with difficult and diffuse tumours need to be kept under constant observation over the years, receiving injections as the recrudescences of the tumour indicate.

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SPONTANEOUS PARALYTIC ILEUS*

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FOR many years the occurrence of a distinctive form of paralytic ileus has been recognized within Mysore State, South India. This differs from classical paralytic ileus in that it is not associated with operations, peritonitis, mechanical intestinal obstruction, or other recognizable cause, and is characterized by rapidly developing paralysis of the small intestine appearing spontaneously in previously healthy persons. The symptoms are severe and the mortality is considerable.

Although the condition is well known to surgeons and medical practitioners in Mysore State, it has received little, if any, recognition farther afield, for the reason that no account of it has ever found its way into the general surgical literature. The only known published description of this form of paralytic ileus is by Subba Rao (1929), and this appeared in the *Proceedings* of the Mysore Medical Conference in 1929. It is therefore thought that a full description, based on twelve years' experience, of this little-known but distinctive clinical entity may be of interest and may aid in solving the problems to which it gives rise.

* Received for publication, July, 1948

MATERIAL

This paper is based on 33 cases of spontaneous paralytic ileus treated in the Kolar Gold-field Hospital, Mysore State, South India, between 1936 and 1948. Thirty-one individuals comprise the 33 cases, as one man had three attacks within four years (verified by operation in the first instance). All the patients were male Indians, the hospital mainly treating mine employees.

Of the 33 cases the diagnosis was proved by operation in 12 cases and was made clinically in

21 cases, being confirmed by post-mortem examination in one of the latter.

CLINICAL HISTORY

The history is that of abdominal pain and vomiting, with the early development of abdominal distension and complete intestinal obstruction. Pain is always the first symptom, is of gradual onset, and, whilst it varies considerably, is not of great severity. It is intermittent and poorly localized, and is accompanied by a constant feeling of fullness.

Abdominal distension is invariable, appearing regularly as one of the earliest signs. It often develops within one to three hours of the pain and occasionally has been reported as appearing almost simultaneously with it.

Vomiting occurs in the majority of cases, and a history of multiple vomiting is usual.

The early onset of obstruction is a feature of the condition, though occasionally there is a history of the passage of fæces or flatus immediately before, or very shortly after, the onset of symptoms. In all cases, however, there is complete obstruction. A history of previous attacks of identical symptoms has been obtained from 6 patients, one of whom had three attacks. One of 3 cases reported by Narasimha Iyer (1946) was operated upon for a second attack.

CLINICAL FINDINGS

General Condition: Pain and discomfort are invariable, and dehydration and toxæmia are frequent, depending in severity on the duration of the illness.

Temperature and Pulse: The temperature is subnormal and the pulse, except in late cases, is not increased in rate, but the volume is frequently poor. Average for 33 cases on admission: Temperature 97·2° F.; Pulse 65.

Distension: This is always present and may be very severe. It is a characteristic early sign, and was well established in 8 cases seen three to four hours after the onset of symptoms. Radiographs have demonstrated the presence of dilated loops of small intestine, with well-marked gas pattern and large fluid levels (*Figs.* 487–489), as early as four to five hours after the onset of symptoms. Distension tends to increase as the symptoms progress, producing a uniform enlargement of the abdomen.

Peristalsis: Whilst a silent distended abdomen is a typical finding in fully developed cases, audible peristalsis may be present, particularly in cases which are seen early or are in the stage of recovery. If present it is diminished in force and frequency. It is recorded as present on admission in 11 cases, and absent in 13, this particular not being known in the remainder.

Mild to moderate unlocalized deep tenderness is usual.

Rigidity: True rigidity is not found, but some degree of generalized guarding is usual. This is due to the tenseness of distension, a characteristic physical sign of spontaneous paralytic ileus.

Dullness: The flanks are dull from the large collection of fluid in distended loops of small intestine, and the most prominent surface of the abdomen is usually tympanitic. Liver dullness may be diminished, and in one case its absence was demonstrated pre-operatively.

SPECIAL INVESTIGATIONS

Radiological Findings.—Intestinal obstruction is well demonstrated by abdominal radiographs. The earlier cases in the series were not X-rayed, but increasing reliance is now placed on X rays in diagnosis. The diagnosis of intestinal obstruction is confirmed by the finding of gas and fluid levels in the small intestine. Typical films for two cases which were operated upon are shown in *Figs.* 486, 487, and from cases diagnosed clinically in *Figs.* 488–490. The main feature of these films is the presence of large amounts of gas in the small intestine, principally the jejunum, and of numerous fluid levels held up in inert distended loops of small intestine. Step-ladder arrangement of loops is seen in *Fig.* 487. An important diagnostic point is the comparatively short time within which an extensive paralytic ileus develops. This is well brought out in *Figs.* 487–489, where the history of illness on admission was only four hours in each case, the radiographs being taken soon after admission. These findings are in agreement with the clinical observation of early distension.

FIG. 486.—Spontaneous paralytic ileus. Gas and multiple fluid levels in small intestine. Operation: recovered.

Pathological Investigations.—With the exception of hæmoconcentration in late or severe cases, and the mild anæmia usual in the South Indian, nothing significant was found in examinations of hæmoglobin, colour index, and diameter and counts of R.B.C. In 11 cases the total leucocyte count averaged 7300, differential counts being within normal limits. Plasma-chloride estimation soon after admission in 4 cases showed depletion of chlorides in 3 cases (491, 410, 514, 585 mg. per cent).

Oliguria may be prominent in severe cases, but with the exception in a minority of a slight cloud of albumin with a few granular casts as a transient toxic phenomenon, urinary findings were normal. In cases in which recovery was marked by diarrhœa

numerous examinations of fæces for bacillary exudate, amœbæ, or other abnormal findings have been uniformly negative.

Operative Findings.—On opening the abdomen a mass of distended inert coils of small intestine bulges forwards, filling all the available space. A small amount of clear free fluid is almost always present between the coils. In one case this fluid was chylous. Dilatation was limited to the small intestine in all cases. Both gas and fluid were contained in the affected intestine.

Some variation in the extent of small intestine involved was observed. In 7 cases the whole of the small intestine from the duodenojejunal flexure to the ileocæcal valve was involved. In 5 cases (1 post-mortem) the extent of small intestine affected was: 1, jejunum only; 1, whole of jejunum and upper two-thirds of ileum only; 3, whole of small gut a few inches from the duodenojejunal flexure to within 6 in. of the ileocæcal valve.

In none of the cases was spontaneous motility present in the affected gut. Contraction of distended

FIG. 487.—Spontaneous paralytic ileus. Ladder pattern due to gas and fluid levels in small intestine. Four hours' history on admission. Operation: recovered.

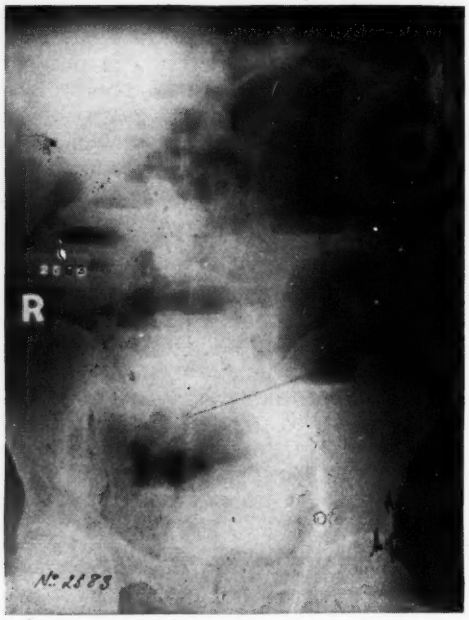

FIG. 488.—Spontaneous paralytic ileus. Gas and fluid levels in small intestine: four hours' history. Conservative treatment: recovered.

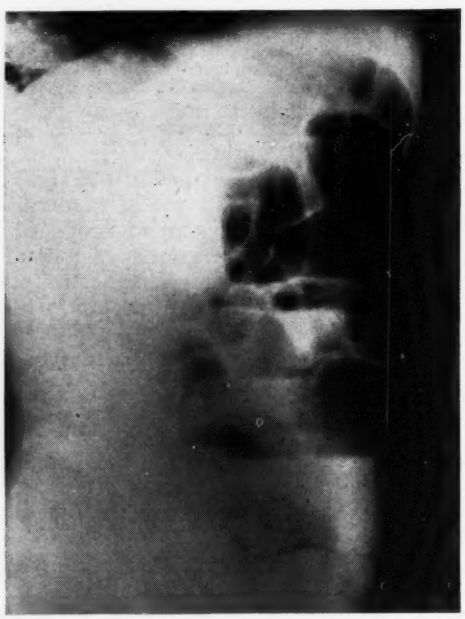

FIG. 489.—Spontaneous paralytic ileus. Same as *Fig.* 488. Gas and multiple fluid levels in small intestine seen in lateral position with patient standing.

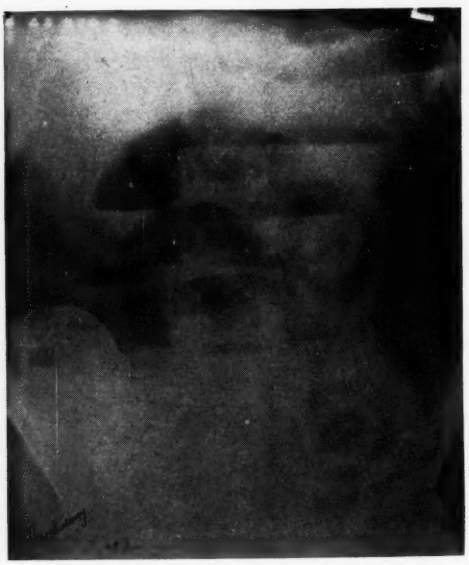

FIG. 490.—Spontaneous paralytic ileus. Gas and fluid levels in small intestine with ladder pattern. Conservative treatment: recovered.

loops of small gut occurred in 2 cases after emptying and stimulating them by the application of pressure through very hot towels. In only one case was a wave of peristaltic contraction seen to follow such stimulation. In 4 cases manipulation of the lower ileum was succeeded by partial filling of the cæcum.

In 2 cases the dilated coils of small intestine were distinctly cyanosed. Root glands were enlarged in 1 case, and œdema of the mesentery of the small intestine was noted in 1 case.

In no case was peritonitis found. No primary mechanical obstruction was present in any case, but doubtless a secondary mechanical element was present from acute kinking of coils in those cases with gross distension. Subba Rao (1929) confirms the absence of mechanical obstruction and states: "I have performed exploratory laparotomy in many of these cases, and have never found any mechanical cause of obstruction."

The stomach, duodenum, cæcum, appendix, and the whole extent of the colon were without exception normal, and of normal dimensions.

DIAGNOSIS

The diagnosis of spontaneous paralytic ileus probably presents little difficulty when the disease assumes epidemic proportions, affecting, as it may, several members of families. Although such episodes have been described by observers in other parts of Mysore State, in some of which the disease appears to be commoner than in the Kolar Gold-field, they have not been seen by the writer.

To the observer familiar with the condition, cases seen early may not be difficult to diagnose, but late cases may deceive the elect. The diagnosis is essentially based on the occurrence in a previously healthy person of complete and rapidly developing small-gut obstruction with early distension, and, typically, absent peristaltic sounds. The clinical findings will include massive abdominal distension, inability to pass fæces or flatus, negative results of enemata, and characteristic X-ray appearances. The latter not only confirm obstruction of the small intestine, but show it to be extensive and complete.

A very helpful diagnostic sign in early cases is the absence of audible peristalsis, and further points of importance in such cases are the absence of localized pain or rigidity, the presence of a subnormal temperature with a normal or slow pulse-rate, and a total and differential white blood-count within normal limits.

Later cases are more difficult to diagnose, and the proportion of exploratory laparotomies in this group will always be higher than in early cases. The most difficult intra-abdominal condition to exclude is mechanical obstruction, which must always be suspected in early cases in which audible peristalsis is present, and in late cases in which ileus may be superadded to mechanical obstruction. The laparotomies performed later in this series took place because this exclusion could not be made on clinical grounds. A clear history of early and gross abdominal distension supported by X-ray evidence is against mechanical intestinal obstruction, in which the presence of gas and fluid levels in long tracts of the small gut is a later phenomenon. In mechanical obstruction the pain is much more severe and more localized than in spontaneous paralytic ileus, and persistent raising of the pulse-rate is also to be expected. Except in the latest stages of mechanical obstruction, when exhaustion of the intestinal musculature has supervened, audible peristalsis is exaggerated in frequency and loudness, and visible peristalsis is also present.

In intestinal strangulation Gius and Peterson (1944) regard three criteria as helping a diagnosis—namely, a history of abdominal pain of sudden onset, which persists between cramping exacerbations; localized tenderness, spasm, and a tender palpable abdominal mass; and persistent tachycardia and leucocytosis after the restoration of fluid balance. In spontaneous paralytic ileus, although the onset of pain may be sudden, the pain is milder and more continuous. There are no localizing abdominal signs or mass, and tachycardia and leucocytosis are absent. Nevertheless the only case of non-paralytic intestinal obstruction in twelve years which was erroneously diagnosed as spontaneous paralytic ileus was in this group. The patient was admitted in 1939, when spontaneous paralytic ileus was demonstrated at operation. He was re-admitted two years later for intestinal obstruction, which was thought to be a recurrence of his previous complaint. He was treated conservatively with a fatal outcome, and a post-mortem examination revealed intestinal strangulation from an adhesion with a long closed loop of gangrenous small gut. From this experience it is concluded that the clinical diagnosis of spontaneous paralytic ileus is unjustifiable in a patient with the scar of a previous abdominal section.

In addition to mechanical intestinal obstruction, diagnostic difficulties may be experienced in cases of peritonitis from any cause after the supervention of classical secondary paralytic ileus. The most difficult entity to exclude in this group is a perforated typhoid ulcer: findings suggestive of this condition are a raised temperature and increased pulse-rate (average for 15 typhoid perforations, of which 6 were ambulatory, admitted to this hospital in recent years: T. 100·7° F.; P. 107), localized tenderness and rigidity which persist, at least to some extent, after the full development of ileus, and a relative polymorphonuclear leucocytosis. In other perforations, more pronounced localized tenderness and generalized rigidity and a persistent elevation of the pulse-rate are present, and a polymorphonuclear leucocytosis is to be expected.

Difficulties may also arise from meteorism due to any cause, although in meteorism the distension is essentially gaseous, and a step-ladder arrangement of fluid levels is not found (*Fig.* 491). Predominantly gaseous distension of the small intestine has been seen in spontaneous paralytic ileus, but appears to occur in an occasional early and mild case.

Here it may be observed that although the operative diagnosis of paralytic ileus is usually unmistakable, some confusion may arise in those cases in which the last 6–8 in. of the ileum escapes the paralytic process. When this happens the normal terminal ileum is heavily pressed upon by the fold of mesentery which is dragged downwards by the weight of the inert and overloaded coils of

paralysed ileum from higher up but now occupying the iliac fossæ, and the uncovering of the junction of the collapsed and the obstructed gut is liable to give rise to the momentary suspicion of mechanical obstruction or even of partial volvulus. Close examination shows no sign of primary mechanical obstruction, and manipulation and rotation of the dependent coils of ileum produce no effective relief

FIG. 491.—Enteric fever with meteorism: well-marked gas distension of small intestine. Recovered.

of the obstruction, the true nature of which is paralytic ileus.

In the variety of incomplete paralysis of the ileum referred to, the factor of compression of the normal terminal part of the ileum is added to the partial, but purely secondary, element of mechanical obstruction which exists at points of angulation of the gut wall in all forms of developed ileus.

TREATMENT AND COURSE

The treatment of spontaneous paralytic ileus is conservative. Hance (1946), Balakrishna Rao (1946), and others, working independently, have also reached this conclusion. As Hance (1946) says, treatment by the recognized non-operative methods is "far superior" to surgery. The aims of treatment are the correction of dehydration, toxæmia, and cardiac and circulatory embarrassment, and the decompression of intestinal obstruction by intubation, until recovery ensues.

The following measures are adopted for all cases in which a diagnosis, or provisional diagnosis, of spontaneous paralytic ileus is made :—

Intestinal decompression by continuously indwelling Ryle's or Levine's tube.

Continuous intravenous salines.

Administration of morphine in full doses.

Hourly pulse and four-hourly temperature charts.

Fluid balance chart.

Ryle's tube is passed as far as the duodenum, and retained until the obstruction is fully relieved. Aspiration through the tube is performed with a 10-c.c. syringe every 20 to 30 minutes, the aspirate being measured and kept for inspection. When the patient has become accustomed to the treatment, and the static intestinal contents have largely been removed by aspiration, he is permitted to drink water, which is aspirated immediately after swallowing. The times of giving fluid and aspirating are recorded on the fluid balance sheet. When a favourable fluid balance has been established aspiration is withheld for 30 minutes after swallowing, but intubation is not discontinued until aspiration has been unnecessary for 12 hours. The average duration of intubation in 16 cases which recovered and in which data on this particular are accurate, is 65 hours.

Intravenous salines are started on admission and continued until recovery. Excluding severe cases which died soon after admission, and mild cases in which parenteral fluids were unnecessary, it is found that 18 cases received an average of 11·4 pints of intravenous saline within a period of three days. Until early in 1948 normal saline was given intravenously, but now half normal saline is used with more satisfactory chloride and water replacement as shown by estimation of urine and plasma chlorides and urinary output.

Morphine is given in full doses, and is a valuable aid in the management of these cases. Besides its sedative action it is a stimulant to small-intestinal activity. Earlier in the series, the effects of repeated injections of pituitrine 1 c.c., eserine gr. $\frac{1}{50}$, and prostigmin 0·5 mg. were investigated but were without apparent beneficial effect in any case; the therapeutic effect of a spinal anæsthetic was also tried in one case also without benefit.

Frequent temperature and pulse charts are valuable when the diagnosis has to be reviewed, and in assessing progress. An afebrile course with no increase in pulse-rate is usual in cases uncomplicated by operation or reaction to intravenous salines.

Enterostomy.—In the view of Subba Rao (1929) the mortality of this procedure is prohibitive. It was mechanically unsuccessful in one early and fatal case in this series in which it was tried, and is to be condemned.

Progress of Cases.—Serial radiographs: Progress in treatment is assessed on clinical findings; radiographs provide confirmation of progress. *Fig.* 492 shows gas causing distension of the jejunum and ileum. This radiograph, from a typical case, was taken on the morning of admission, and the patient had a 6 hours' history at the time the film was made, and had walked 2 miles despite vomiting and abdominal distension. Recovery began 3 hours after admission, and a second radiograph (*Fig.* 493), taken 24 hours after the first, shows the degree of recovery that had then occurred. *Fig.* 494 is from the same case shown in *Figs.* 488, 489, but was taken 24 hours later. It demonstrates the improvement which had taken place in this interval.

Recovery of intestinal function begins in the majority about two days after admission, but may be delayed for as long as a week. It is frequently signalized by the passage of flatus. Diarrhœa is not infrequent in recovery, as in other forms of paralytic ileus. Diarrhœa occurred in 11 cases (4 operated on) which recovered, and commonly continued for about three days. In one case which was operated

upon diarrhœa continued for six days. Examinations for evidence of intestinal infection in such cases were all negative.

FIG. 492.—Spontaneous paralytic ileus. Gas in small intestine: no fluid levels: 6 hours after onset. Conservative treatment: recovered.

Cases which die do so within one to two days of onset, from oligæmic shock caused by the massive loss of fluid into the intestines. Such cases do not die of peritonitis.

PROGNOSIS AND MORTALITY

The factors which appear to determine the outcome of this disease are the severity of the attack, its duration before treatment, the presence of audible peristalsis on admission, the making of a correct diagnosis without operation, and the early institution of adequate conservative treatment.

Variation in the severity of attacks undoubtedly occurs, and the importance of early treatment in all cases cannot be over-emphasized. There is some evidence that patients with audible peristalsis on admission are either mild or early cases.

In this series audible peristalsis is recorded as having been present in 11 cases (2 operation, 9 clinical). The average pre-admission history in this group was 5 hours, and one of the cases died.

Audible peristalsis was absent in 13 cases (5 operation, 8 clinical) with an average pre-admission history of over 10 hours, and in this group 5 cases died.

Balakrishna Rao (1946) also stresses the significance of audible peristalsis, and considers that the mortality of cases in which this sign is present is in the region of 25 per cent, and is more than doubled in cases without it.

Although operation was more frequent in the later, and therefore more severe, cases, in which the difficulties of diagnosis are greatly increased, the additional burdens of a general anæsthetic and a laparotomy are most unfavourable to patients already suffering from a severe disease. The unavoidable pre-operative use of atropine, which reduces intestinal tone, is also unhelpful. In the 33 cases in this series there were 9 deaths, a mortality of 27·3 per cent. In the 12 cases operated upon there were 6 deaths, a mortality of 50 per cent, and in the 21 cases treated conservatively there were 3 deaths, a mortality of 14·3 per cent.

FIG. 493.—Spontaneous paralytic ileus. Same as *Fig.* 492. Appearance 24 hours later. Diminution of gas in small intestine.

FIG. 494.—Spontaneous paralytic ileus. Same case as *Figs.* 488, 489. Appearance 24 hours later. Diminution of gas and disappearance of fluid levels. In this case a Miller-Abbott tube, seen doubled, was used.

Other observers have reported considerable mortalities in larger series. Subba Rao (1929) reports 22 known deaths in 64 cases (a mortality of 34·37 per cent), but as the outcome was not known in 10 (15·62 per cent), only 32 (50 per cent) are known to have recovered. Of 9 of his cases treated by enterostomy, 7 (77·78 per cent) died. Balakrishna Rao (1946) expresses the view that " the mortality is high ", and in very late and severe cases nearly 100 per cent.

DISCUSSION

Aetiology.—The cause of this form of paralytic ileus is not known, but there is a widespread belief that a dietetic factor is involved. The term ' spontaneous ' is used merely to distinguish this form of ileus as an entity. The disease appears to occur in the poorest section of the population, which uses the millet ragi (*Eleusine coracana*) as its staple diet. Although it is not proved that this foodstuff is the causative factor, experienced surgeons familiar with the condition are generally of opinion that it is. Thus Hance (1946) states that the cases seen by him " without exception gave a history of having eaten ragi which had been stored underground in pits ". Subba Rao (1929) describes this form of ileus as " acute intestional obstruction caused by the ingestion of very old ragi grain stored in underground pits ". Balakrishna Rao (1946) observes that adynamic ileus is common amongst the poorer classes of labourers who eat ragi, and does not occur in jowar eaters.

In the 33 cases here described, 22 were known to be habitual eaters of ragi, and as this is a very common item of local diet probably many more of the patients ate it regularly. It seems possible that some toxic substance capable of producing paralytic ileus may be elaborated in millet, especially when old and after prolonged storage in unfavourable conditions underground. It has been reported by several observers in Mysore that paralytic ileus is more prevalent in times of scarcity, although this may be because old and spoiled ragi is then eaten of necessity. The simultaneous, or almost simultaneous, occurrence of numbers of cases in a community, a phenomenon which has been described in several other places in the State, suggests a parallel with food poisoning. That the food factor in ragi popularly supposed to be responsible may be elusive is suggested by the fact, noted by the writer more than once, that symptoms of ileus have developed in the head of the household some hours after the ingestion of a meal of cold ragi, whereas other members of the family have shared the repast with impunity. Possibly a quantitative factor may come into play in such cases.

Once adynamic ileus has been initiated, the large bulk and weighty components of the South Indian vegetarian diet introduce a mechanical factor favouring secondary kinking of the small intestine and the perpetuation of its loss of propulsive motility.

It is also possible that malnutrition may play a part in the aetiology, since the syndrome has been noted to occur in the poorest sections of the population. This may also account for the relative rarity of the condition amongst the mining employees, whose standard of nutrition is above that of the average rural inhabitants, and who in any event would not be compelled by force of circumstance to eat old and unpalatable ragi.

Clinical signs of vitamin deficiency, for example, whilst not uncommon in applicants for employment and in the children of employees, are an infrequent finding in employees themselves. That vitamin-B deficiency may, however, give rise to a variety of adynamic ileus in the absence of clinical signs of avitaminosis is strongly suggested by Leithauser (1948), who has reported 6 cases of " atypical adynamic ileus ", 5 of which were cured by the administration of thiamine chloride and vitamin-B complex in large doses. The cases differed from those on which this paper is based in several respects —for example, by the presence of a spurious type of diarrhœa associated with gross distension in 4 of the cases, and by ileus of the left half of the colon in 1 case. Nevertheless distension was a feature of all Leithauser's cases, in at least one of which the ileus affected the small intestine, and the author issues a warning that the condition he describes may lead to erroneous surgical diagnoses and needless operations.

An infective agent does not appear to play any part in the aetiology of spontaneous paralytic ileus. This is suggested by the almost constant finding of a low subnormal temperature, the absence of leucocytosis (average count in 11 cases, 7300), and the repeatedly unsuccessful search for evidence of intestinal infection in the form of bacillary exudate, dysenteric organisms, *Entamœba histolytica*, or other abnormalities in cases in which recovery has been associated with diarrhœa.

Ten examinations of intestinal contents for poison, all with negative results, are reported (Natarajan, 1946) to have been made by the Government Chemical Examiner in Bangalore from specimens obtained at autopsies on cases of spontaneous paralytic ileus.

Distribution.—One of the most remarkable features of the syndrome described in this paper is its apparently very limited geographical distribution. Nobody who has seen these cases can doubt their reality and distinctiveness, which makes it all the more strange that such an impressive condition should have escaped wider recognition for so long. Since, however, it has done so in a well-served state like Mysore, where it boasts at least one vernacular name, there is a distinct possibility that it has also done so in other countries within the confines of which it may be comparatively well known.

Reports in the literature of other countries of a dietetic element in the aetiology of paralytic ileus are few. Yasnogorodskiy (1936) states that " alimentary paralytic ileus is by no means rare, and is caused by over-abundant, unaccustomed, indigestible, or spoiled food."

The cases reported by Leithauser (1948) suggest that a syndrome with certain resemblance to that known in Mysore, and which responds to vitamin therapy, is of occasional occurrence in the U.S.A.

If ragi is implicated as a causative factor the geographical range of this millet as a foodstuff might suggest an associated incidence of spontaneous paralytic ileus, although it must be borne in mind that methods of preparation and storage may be

important, if not decisive, and that there are at least seven known varieties (Narasimhan, 1946) of this crop, with several scientific and popular pseudonyms. In India, Mysore State is probably the most important centre of ragi cultivation, followed by Madras, but it is also grown in Bombay, Baroda, Bihar, Hyderabad, Deccan, and to some extent in the Punjab. Personal replies to a questionnaire circulated early in 1946 to 24 prominent medical men in India confirmed the recognition of spontaneous paralytic ileus in Mysore State, and to a smaller extent in Madras, but not elsewhere. Outside India ragi is grown for food in Ceylon, Madagascar, Malaya, the Belgian Congo, East Africa, Upper Egypt, and Abyssinia.

In 1946, two surgeons in Kenya (Kerr and Kirkaldy-Willis) published a description of 7 cases, which although classified as volvulus of the small intestine, have several important points in common with the entity described in the present paper. These include :—

1. African vegetarians : The authors state that their patients eat maize, but no details of other vegetable foodstuffs, such as millet, are given. Nevertheless they are of opinion that the condition they describe may well be associated with the dietary habits of the African.

2. Symptoms : Many of the symptoms described in Africans are those noted in India, e.g., onset of pain with early distension, recovery with diarrhœa in some cases, absent audible peristalsis in 5 out of 7 cases.

3. Paralytic ileus : The authors state that " some paralytic ileus was common to all " their cases. The pre-operative finding of absent audible peristalsis in such a high proportion of cases and the high recovery rate are suggestive.

4. Laparotomy findings : These disclosed no adhesions in any case. The appearances described greatly resemble those cases seen by the writer in which the last few inches of the ileum do not share in the paralytic process, and appear empty and collapsed. In such cases the uncovering of a sudden transition from grossly dilated coils of small intestine to normal gut presents a picture open to erroneous interpretation by anybody unfamiliar with the whole syndrome.

Whether the form of ileus described in this paper occurs outside South India must for the present remain an unanswered question. It is hoped that the publication of this series of cases may lead to additional information by drawing attention to one of the diseases which find no place in the literature.

SUMMARY

A description, based on 33 cases, is given of a form of paralytic ileus of the small intestine which occurs in Mysore State, South India, and which is characterized by the rapid development of complete intestinal obstruction in previously healthy persons. The clinical findings, treatment, and course are described, diagnostic difficulties are summarized, and problems of aetiology and geographical distribution are discussed.

My acknowledgments are due to Messrs. John Taylor & Sons, London, for permission to publish this paper, and to those surgeons in Mysore State and elsewhere who found time to reply to a questionnaire. I also acknowledge with appreciation the assistance afforded by my medical colleagues in the Kolar Gold-field Hospital, and in particular the special help so readily extended by Mr. G. E. Dunkerley, F.R.C.S.E., who treated a number of the cases and assisted in the study and compilation of the records.

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MESOTHELIOMA OF THE PERITONEUM

REPORT OF A CASE AND REVIEW OF THE LITERATURE

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CASE REPORT

CLINICAL HISTORY.—Fred. J., a blacksmith's striker aged 20, first reported to the medical out-patient department of the General Infirmary at Leeds on Oct. 30, 1945. In June, 1945, he had noticed occasional epigastric pain in the mornings, and by September this had become more severe ; it was felt high in the epigastrium, and was worst on waking, gradually becoming less during the morning and disappearing about 2 p.m. ; it was associated with loss of appetite and nausea ; occasionally he vomited, which relieved the pain a little ; he stated that he was losing weight. Physical examination revealed no abnormality. A fractional test-meal was normal, and an X-ray examination with a barium meal showed no abnormality in the stomach and duodenum. Two œsophageal diverticula which were found did not appear relevant.

His symptoms persisted, and in December, 1945, he noticed swelling of the abdomen, and in March, 1946, he was admitted to a medical ward with gross ascites. His appearance is recorded as pale and wasted; there was some enlargement of the cervical lymphatic glands, although this appears to have been an acute condition following a sore throat. The ascites was associated with an umbilical hernia and hydroceles of inguinal hernial sacs; otherwise physical examination showed no abnormality. Paracentesis abdominis was performed on four occasions in two months, about 30 pints of straw-coloured fluid being withdrawn each time;

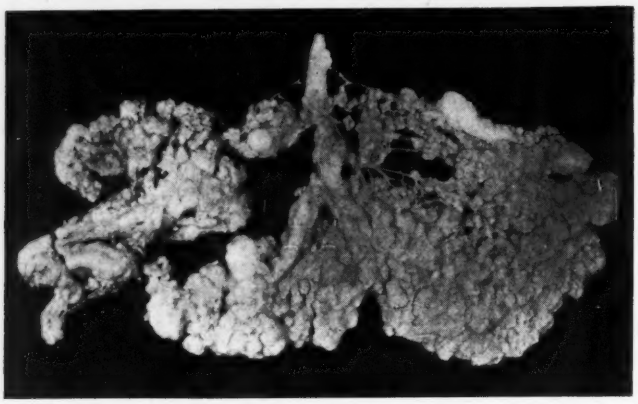

FIG. 495.—A portion of the excised omentum to show the finely granular surfaced nodules of growth.

after paracentesis the spleen and liver were not palpable, but nodules were felt and were thought to be in the omentum.

X-ray examination of the chest showed the diaphragm to be at a very high level, but there was no evidence of primary disease in the heart or lungs. There was complete loss of detail in the abdomen owing to the ascites. No abnormality was found in stomach, duodenum, or colon. Two specimens of fæces were negative for tubercle bacilli. The ascitic fluid contained 3·5 per cent of protein. Films showed abundant lymphocytes but no organisms. In a guinea-pig inoculated and killed after six weeks no tuberculous lesions were detected.

During his stay in hospital the appetite returned and the epigastric pain disappeared and he has had no further symptoms. In May, 1946, he was transferred to a Municipal hospital where paracentesis was performed every 14 days, at first as an in-patient, later as an out-patient. In August, 1947, he was re-admitted to this Municipal hospital for review; he was no longer pale and wasted, and it was found that the ascites could be controlled by daily injections of mersalyl. X-ray examination of chest and abdomen and of the digestive and urinary tracts was normal. Liver function tests showed no abnormality, and examination of blood, urine, fæces, and ascitic fluid revealed no fresh facts. He was transferred to the General Infirmary at Leeds for consideration of lieno-renal venous anastomosis.

While under observation he developed strangulation of the umbilical hernia, and herniotomy was performed on Jan. 8, 1948, a rapid examination of the abdominal contents being possible. The liver and spleen were smooth, of normal consistence and not enlarged; the stomach and intestines appeared normal, except for the strangulated areas of ileum. The peritoneum showed areas of opaque white thickening, but the most obvious changes were found in the omentum; in the upper part fat was almost absent, revealing about half-a-dozen large vessels, both arteries and veins, each some $\frac{3}{16}$ in. in diameter; the lower half of the omentum appeared to be a sheet of granular fat with a few pea-sized cysts, but closer examination showed the 'granular fat' to be a collection of pearly nodules. A hand introduced into the pelvis brought up a mass the size and weight of a cricket ball; this was covered with pedunculated vesicles varying in size from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. in diameter and was loosely connected with the omentum by three fatty strands which contained no obvious large blood-vessels. This mass was removed and a portion of the omentum taken for histological examination.

Recovery from the herniotomy was uneventful, and a month later the abdomen was re-opened by Mr. Flint. Careful search failed to reveal any intra-abdominal growth other than the peritoneal: the appendix was normal. Although the pelvic peritoneum covering the bladder and rectovesical pouch was indurated and nodular, indicating that curative treatment was impossible, it was thought that removal of the large mass of tumour within the omentum might relieve the ascites, and accordingly the major part of this structure was excised. During the following week a moderate amount of fluid collected in the abdomen, and then remained stationary without further treatment, and he was discharged on Feb. 19, 1948. In April the abdomen was clinically and radiologically free from fluid, and he was regaining activity.

Re-examination of an X-ray film of the abdomen taken in April, 1946, revealed a mottled area over the right sacro-iliac region, approximately 3 in. by 2 in. and inconstant in position. Since this is not shown by X-ray examination in April, 1948, it probably represents the mass which was removed at herniotomy, and indicates a very slow rate of growth of this structure.

MORBID ANATOMY.—The material removed at the first operation consisted of a small biopsy together with an irregular solid mass of tissue measuring 6 cm. by 6 cm. by 5 cm. and showing, on the surface, areas of calcification and thin-walled vesicles measuring up to 2 cm. in diameter. On section this was partly white and soft and partly yellow and firm.

The specimen removed at the second operation (*Fig.* 495) consisted of a large portion of greater omentum composed of finely granular surfaced nodules of growth strung together by fine strands, with masses of indurated adipose tissue and occasional thin-walled cysts measuring on an average 0·5 cm. in diameter and filled, after formalin fixation, with jelly-like material.

HISTOLOGY.—Histologically the structure is that of a papillary tumour, the processes of which are covered by a single layer of columnar, cubical, or flattened epithelium (*Fig.* 496). Many of the cells have swollen rounded extremities and tend to be separated from each other, giving a saw-tooth appearance (*Fig.* 497). A gradual transition is seen in many places from the normal peritoneal serosa first to vegetative mesothelium and then to neoplastic tissue (*Figs.* 498, 499). The tumour processes have expanded extremities and a myxomatous stroma, but deeper down the stroma is more densely fibrous (*Fig.* 496). There is downward extension of the epithelial cells in the form of crypts, producing a ramifying network of channels assuming the character of an infiltration (*Fig.* 496). The cells lining these crypts are similar to those covering the processes and in places they form solid cords and small cell groups. The cells are fairly regular in size and shape, with large vesicular nuclei and fairly abundant granular basophilic cytoplasm. In one or two areas the infiltrating cells are more irregular and more closely packed, with hyperchromatic nuclei, but still usually retaining a glandular structure. Only occasional mitotic figures are present.

The mass removed from the pelvis at the first operation is formed of dense fibrous tissue with a ramifying epithelial network. Some of the spaces are large, with ingrowing papillary processes; some contain desquamated cells, histiocytes, and lymphocytes, others a bright eosinophilic coagulum with marginal vacuolation. This coagulum is also present in the cysts and some of the superficial

epithelial crypts. It is certainly not mucin and is probably albuminous in nature.

Calcareous bodies (calcospherites) are a striking feature. They are patchily distributed in fair numbers throughout the tumour and tend to occur in groups, often in epithelial-lined spaces. The pelvic mass shows numerous large calcospherites in the cystic spaces (*Fig.* 500). They are also present apparently lying free in the stroma (*Fig.* 501). but observation under the high power shows that even here a narrow surrounding rim of epithelial cells can often be made out (*Figs.* 502, 503). It is most likely that those lying free have arisen in this way.

Inflammatory changes are much in evidence. The infiltrated zone consists of fibroblastic tissue with heavy focal and diffuse lymphocytic infiltration and numbers of eosinophils, plasma cells, and polymorphs. In addition there is capillary engorgement. Some large veins have marked granulomatous intimal thickening and many of the arteries are unduly thick-walled. In certain areas of the omentum removed at the second operation inflammatory changes are especially intense, with fat necrosis and heavy polymorph infiltration almost amounting to suppuration. These more acute changes are probably the result of the operation performed a month before.

This is certainly a malignant infiltrating tumour, but evidently slowly growing in view of the calcification and lack of mitotic figures. In places a definite transition can be traced from normal peritoneum to tumour cells.

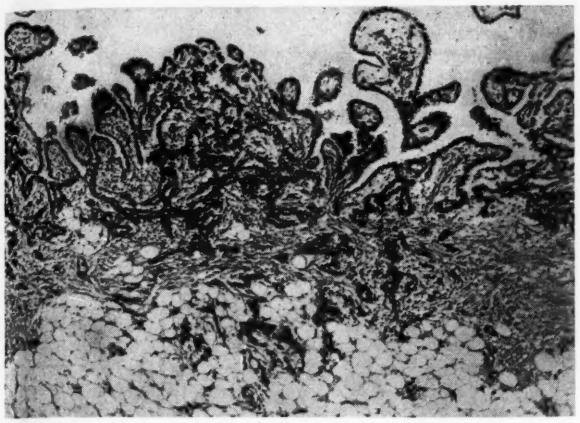

FIG. 496.—General microscopical appearance of the tumour, showing superficial infiltration of the omental adipose tissue. (× 30.)

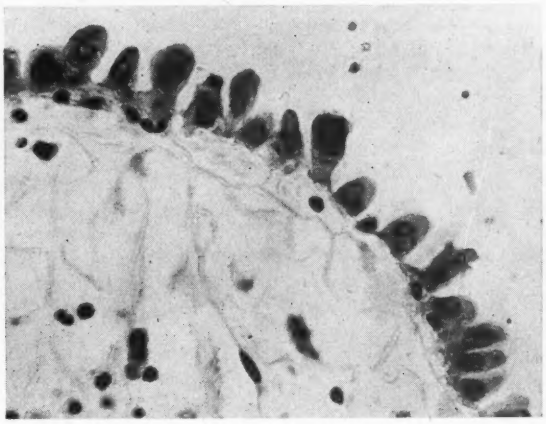

FIG. 497.—Saw-tooth appearance of the cells covering the papillary processes, with swollen rounded extremities and a tendency to separate from each other. (× 450.)

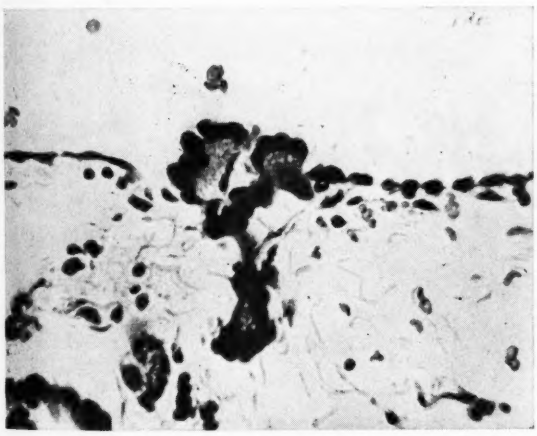

FIG. 498.—To show the transition from normal peritoneum to neoplastic tissue. On left normal peritoneum; on right vegetative mesothelium; in centre neoplastic cells. (× 380.)

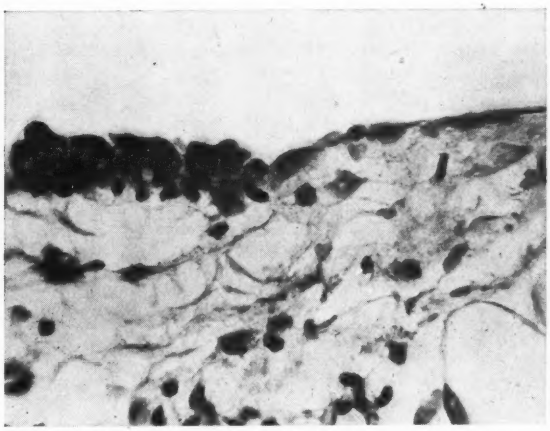

FIG. 499.—Transition from normal peritoneum to tumour cells. (× 400.)

DISCUSSION

This is apparently a rare type of tumour. Neither Professor Flint nor Professor Stewart could recall having seen a comparable example. The rarity of the case was, however, only really appreciated when the literature was examined. The confusion surrounding peritoneal and omental tumours made search difficult, but we have failed to discover a similar case history.

The cases bearing the closest histological resemblance to ours are those of Wells (1935), Hamdi, Louthai, and Schevket's *Case* 2 (1927), and Ramsey and Chomet (1943). Wells records the accidental finding of benign branching villous papillomata scattered over the parietal peritoneum of a man who died following urinary obstruction. Histologically there was gradual transition from normal mesothelium to cubical tumour cells. A few microscopic crypts were also found below the peritoneal surface and there was some increase of cellularity of the connective tissue; no mitotic figures were seen.

Hamdi's second case (adenocœlothelioma) was that of a woman aged 50 with more than a year's

history of abdominal pain suggesting peritonitis or abscess. Laparotomy revealed a little ascites with a few large solid swellings and multiple nodules scattered over the peritoneum; an operative diagnosis of tuberculous peritonitis was made. Eight months later post-mortem examination revealed an ascites of four litres. The peritoneum was thickened and opaque, with nodules which microscopically showed papillary formation and ramifications of gland-like spaces; these were lined by cubical or columnar cells which in some places had invaded the sub-peritoneal tissues. The mesentery was thickened without involvement of the lymph-nodes.

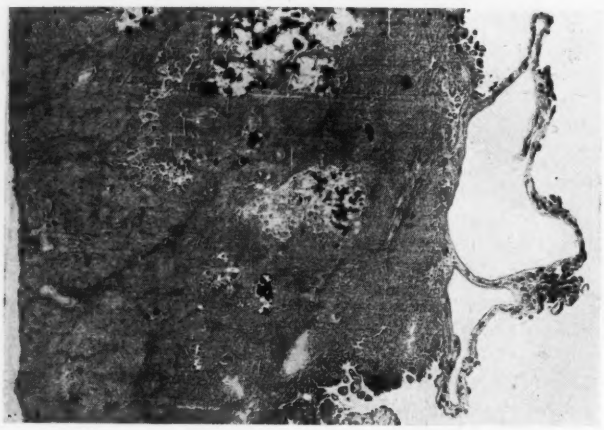

FIG. 500.—A low-power section of the pelvic mass, showing the surface cysts and groups of calcospherites. (× 10.)

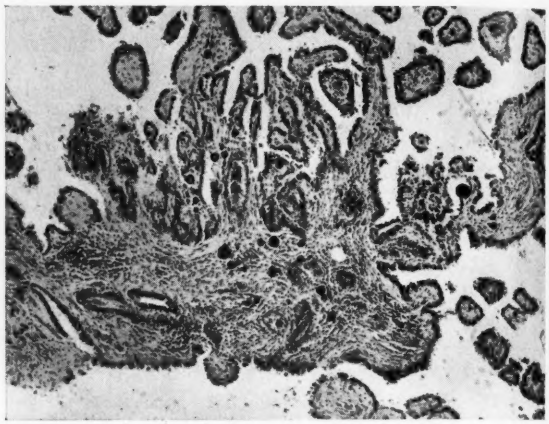

FIG. 501.—Calcospherites in the tumour involving the omentum proper. (× 35.)

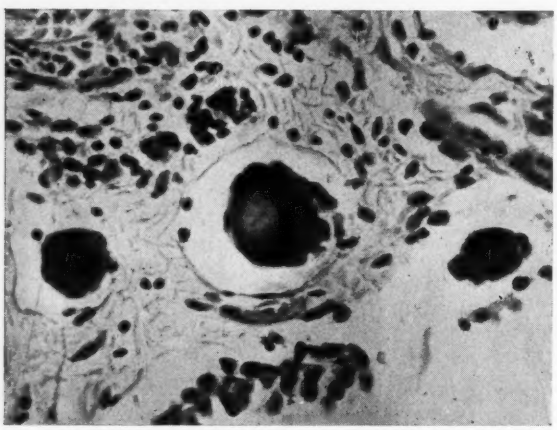

FIG. 502.—To illustrate the mode of formation of the calcospherites. (× 285.)

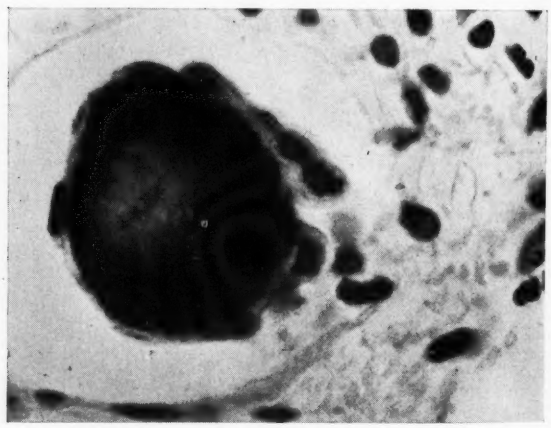

FIG. 503.—High-power view of *Fig.* 502, showing the surrounding rim of epithelial cells. (× 735.)

Ramsey and Chomet report the case of a woman of 62 with two months' history of indefinite abdominal symptoms. Post mortem the abdomen contained six litres of fluid and in the lower abdomen the intestines and pelvic organs were matted together, the peritoneal surfaces being thickened, rough, and nodular, with small vesicles at the edge of the neoplastic tissue. Histologically two types of stroma were seen: a densely fibrous type, and a finer fibrillary form. The covering cells showed rounded, bulging, free extremities with deep indentations between, so that the free border acquired a serrated appearance; the authors state that this appearance is rather characteristic of tumours arising from mesothelium and very different from that of carcinoma. Sections taken from the growth-covered ovary showed transition from normal ovarian serosal cells to tumour cells. The larger nodules contained more stroma, and both infiltration and anaplasia were noted. Elsewhere the tendency was to form papillary processes. No mucin was detected.

A striking feature of our tumour is the presence of calcospherites; typically these occur in arachnoidal endothelioma, but according to Ewing (1940) they may occur in any slowly growing endothelioma. They have also been described in pancreatic carcinoma, and are not an uncommon finding in ovarian serous cystadenomata. We have, however, met only one reported case of peritoneal mesothelioma in which they are described. This was a papillary endothelioma of the great omentum described by Sanes and Kenny (1934) as occurring in a woman of 66 who had had ascites for six months. Post mortem the omentum was thick and firm, with a granular surface and a pseudocystic appearance in places. Metastatic dissemination had occurred to the mesentery, to the peritoneum covering the gall-bladder, parietes, and diaphragm, and to the left pleura. Histologically the tumour was made up of spaces lined by one or more layers of columnar or polyhedral cells with proliferating papillary growth

into the lumen. In many spaces the central portion of the growth showed necrosis. Psammomatous formations were said to be present. Mitotic figures were frequent and tumour cells were seen within vessels. This tumour is obviously of high-grade malignancy and very different from our case.

The naked-eye appearance of the omentum in our case is strikingly similar to that of a case recorded by Karsner (1911). The patient, a woman of 64, gave a four months' history of indigestion with alternating constipation and diarrhœa. At post-mortem examination the omentum was found to be adherent in the pelvic cavity, and was thickened by the presence of numerous nodules each 3 mm. to 15 mm. in diameter. There was slight extension to the gastrocolic omentum, gastrosplenic ligament, small and large intestine, and mesentery. The tumour microscopically was stated to be mesotheliomatous.

Ramsey and Chomet (1943) believe that true tumour cells derived from the peritoneal surface secrete no mucin. Nevertheless, several published cases appear to be similar to the case we have described, except for the production of mucin. Miller and Wynn (1908) record the case of a man aged 32 with a history of two months' vague ill health and ascites. No tumour could be felt in the abdomen even after paracentesis, when twelve pints of viscid fluid were withdrawn. Paracentesis was repeated on several occasions and a limited laparotomy showed that the peritoneum was studded with nodules of growth varying in size from a pea to a grape; these were soft, friable, and had a slimy surface. He died ten months after the onset of symptoms and autopsy showed extensive thickening and nodularity of the peritoneum, including the omentum, with matting together of the intestines. The nodules were of gelatinous consistency and contained sticky semi-fluid material. There was a large mass of growth infiltrating the pancreas. Microscopically the tumour was described as malignant with connective-tissue characters, arising from the endothelium of the peritoneum, and producing a mucoid material. A gradual transition was observed from the apparently normal endothelial cell to the malignant cell. Hamdi's third case (gelatinocœlothelioma) was that of man aged 45, with a five years' history of abdominal swelling for which a provisional diagnosis of tuberculous peritonitis had been made. Post mortem the peritoneal cavity contained seven litres of mucinous fluid and the peritoneum was studded with walnut-sized nodules. In the upper abdomen all the organs were bound together into a large mass, but careful search of the gastro-intestinal tract failed to reveal any primary tumour. Microscopically the nodular growth showed mucin-filled cystic spaces lined by a scarcely recognizable mucin-secreting epithelium; in places the tumour cells formed a continuous surface layer with the peritoneal cells.

Hamilton and Cleland (1946) report the case of a boy aged 11 with a three weeks' history of symptomless swelling of the abdomen in which a mass was palpable. Laparotomy showed this to be a congerie of thin-walled cysts arising from the lateral side of the hepatic flexure of the colon, with other small cysts present in the omentum. Following excision of the cysts and omentum the child was discharged from hospital. The cysts were found to have clear contents and pseudo-mucin was said to be present. Microscopically the spaces were lined by flattened or cuboidal epithelium. Although a congenital origin is not excluded, the authors suggest either lymphangio-endothelioma or peritoneal mesothelioma. Hamdi's first case was a man of 30 with the clinical picture of acute intestinal obstruction. Laparotomy showed the serosa to be covered by multiple pedunculated cysts up to the size of a hazel nut. These were thin-walled and multilocular, lined by cylindrical or cubical cells. and containing bluish staining material. No evidence of infiltration tion could be found. The patient recovered to leave hospital. In neither of these case reports is there any mention of ascites.

Many other cases are recorded as peritoneal mesothelioma, but they are chiefly post-mortem findings of large omental and retroperitoneal masses with a clinical history of ascites of short duration. We have not attempted a complete collection of cases from the literature, but have selected the above records to show that while most of the features separately have previously been described, our case as a whole appears unique—the long history of profuse ascites in a young man, the very limited extent of spread, the presence of calcospherites in a papillary endothelioma, and the immediate relief following excision of the omentum. Willis (1948) maintains that all reported cases of mesothelioma are secondary to an undiscovered primary growth elsewhere. While it is recognized that our case is incomplete without a post-mortem examination, careful search at laparotomy failed to discover any other neoplasm and a silent primary nearly three years after the appearance of metastases must be unusual. From the X-ray evidence, it appears that three years is a very conservative estimate of the duration of growth of the calcified mass removed from the pelvis. The literature suggests the possibility that when an autopsy can be performed the extent of spread of the tumour will preclude any definite opinion regarding its origin.*

We would like to thank Professor E. R. Flint, at whose suggestion this case is published, and Professor M. J. Stewart, for their interest and advice.

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* This patient attended for review during February, 1949, when his abdomen showed no clinical evidence of ascites. He felt well, and had started light work at the beginning of January, 1949.

MISSILE INJURIES OF THE URETHRA*

By D. S. POOLE-WILSON, Manchester

INTRODUCTION

The ability to micturate normally and to reproduce are two of man's most valued accomplishments. War wounds of the urethra, involving as they may the loss of these functions, are therefore apt to produce dismay and depression. The urethra is, however, a small organ. In the male it is but 20 cm. long and approximately 1 cm. in diameter. Nevertheless, it is a tortuous tube and surrounded by the most curious sphincter and erector mechanism in the body. It is therefore not surprising that battle injuries of the urethra are rare, and that when they do occur are often serious and may be the prelude to lifelong physical and mental anguish.

In the early spring of 1944, when the preparations for the Cassino battle were under way, Brigadier Edwards asked me to establish a Genito-Urinary Centre for the treatment of the severe injuries of the bladder and urethra and the urinary complications of injuries in the central nervous system. He, moreover, set me a more difficult task by asking me to draw up some suggestions for the treatment of urethral injuries. There has always been much controversy regarding the treatment of traumatic injuries of the urethra. In war the problem becomes even more complex. My own experience of battle injuries of the urethra was not very great, and in the literature much writing on the subject seemed also to lack the stamp of experience. It was therefore with some trepidation that I approached the problem.

It is well recognized that the repair of a damaged urethra falls naturally into three stages :—

1. The deviation of the urine from the traumatized area.
2. The reconstruction of the urethra.
3. The maintenance of the urethral channel during healing and in later life.

The deviation of the urine can be easily accomplished by performing a suprapubic cystostomy. This relieves retention, avoids extravasation, and removes all immediate danger.

The repair of the damaged urethra is often more difficult and errors may be irretrievable. Prior to undertaking a repair in the Field it therefore seemed imperative to consider :—

1. Whether the operative surroundings facilitate good operative repair.
2. Whether the patient's general condition warrants a prolonged operation.
3. Whether the after-care will be satisfactory.

In Forward Surgery in the Field these conditions are often not fulfilled, and it seemed to me advisable for surgeons under these conditions to avoid carrying out complicated urethral repairs and to be content with performing a toilet of the wounds, a suprapubic cystostomy to divert the urine from the injured area, and when necessary incision and drainage to relieve extravasation or very large hæmatomata. Following this primary treatment it appeared desirable to evacuate the patient as rapidly as possible to the Base for definitive treatment.

This course was accordingly advised. Hard-and-fast rules seemed undesirable, and in those difficult cases where an abdominal injury rendered attention in a Forward Area imperative, then the surgeon had to use his judgement as to whether more damage to the urethra would result from delay and repair at a later date than from a difficult primary operation on an ill patient.

This paper is based on a study of the patients who were referred to the Genito-Urinary Centre.

THE PATIENTS AND THEIR INJURIES

Fifty-three patients suffering from rupture of the urethra due to penetrating missiles have been treated. All other varieties of traumatic rupture of the urethra have been excluded from the series. In almost all instances primary surgical operations had been carried out at Field Surgical Units or Casualty Clearing Stations and the patients reached the Genito-Urinary Centre at varying periods from twenty-four hours after wounding. Many surgeons made great efforts to evacuate patients to the Centre rapidly, and as the front advanced northwards air transport proved a great help.

The distribution of the lesions is shown in the following table :—

Missile Ruptures of the Urethra
(55 Lesions in 53 patients)

Penile urethra	14	55 lesions
Bulbous urethra	25	
Posterior urethra	16	

In two patients double ruptures of the urethra occurred (*Cases* 27, 33). In the former the bulbous and posterior urethra were separately damaged, in the latter the penile and posterior urethra were injured.

The bladder was also injured on three occasions (*Cases* 32, 33, 35).

One patient sustained a double rupture of the urethra and a perforation of the bladder (*Case* 33). A bullet entered to the left side of the anus, perforated to the posterior urethra, ruptured the lateral wall of the bladder, shattered the left pubic bone leaving an opening into the peritoneal cavity, destroyed the left testicle, and amputated the distal half of the penis.

The Projectile and its Course.—The urethra has been wounded by almost every type of missile :—

Shell Wounds (H.E.)	21	53
G.S.W. Machine gun	8	
G.S.W. Automatic rifle or revolver	6	
G.S.W. Rifle	4	
Mortar bomb or Grenade	5	
Mine or booby trap	4	
Unknown	5	

Twenty-two of the patients sustained through-and-through wounds. The remaining 31 suffered

* A Hunterian Lecture delivered on June 6, 1946.

from penetrating injuries. The following table shows the directions taken by the missiles :—

1. *Through-and-through Wounds.*—

Anteroposterior direction	13	22
Postero-anterior direction	5	
Lateral	4	

2. *Penetrating Wounds.*—

Abdominal surface	11	31
Buttock and sacral regions	7	
Perineum	6	
Lateral aspect of pelvis	7	

The urethra is relatively well protected from the sides, and of the missiles entering the pelvis laterally all but four were bullets. It seems probable that small shell or mortar fragments fail to have the momentum necsssary to carry them through the bony and muscular lateral walls of the pelvis and thighs and that the larger fragments generally cause such severe injuries that death supervenes. A bullet, however, traverses the side wall of the pelvis fairly easily and may pass completely through the body or come to rest in the pelvis.

Considering all points of entry it is uncommon to find shell or mortar-bomb fragments larger than 1 in. in length and ½ in. in breadth and depth lodged in the pelvis. The larger missiles usually kill. No case of survival after known injury to a large pelvic artery has been encountered.

The Wounds.—With the exception of the 'explosive wounds' of the perineum the entry and exit wounds conform largely to those seen in other

FIG. 504.—A bullet entering the left thigh has fractured the neck of the left femur and the pelvis. The bullet has broken up and left a trail of fragments across the floor of the pelvis. The posterior urethra was ruptured. (*Case* 47.)

parts of the body. Free hanging testes and the occasional leakage of urine and fæces add the only unusual findings. The presence of the large bony framework of the pelvis ensures a large number of fractures and the consequent deviation of the missile and scattering of bony fragments results in much damage and many large exit wounds. A bullet striking bone may also break up and its further course be marked by a comet-like trail of fragments across the pelvis (*Fig.* 504).

The associated injuries caused by missiles injuring the urethra are shown in the following table :—

Perforation of the peritoneal cavity	4
Perforation of the bladder	3
Perforation of the rectum	10
Injury to testis requiring orchidectomy	17
Injury resulting in partial atrophy of testis	3
Fracture of pelvis	7
Fracture of femur	7
Fracture of sacrum	2
Colostomies for rectal and or perianal injury	19

There is a high proportion of testicular injuries associated with wounds of the penile urethra. As

FIG. 505.—Fracture of the pelvis caused by a through-and-through injury. A bullet entered to the left side of the anus, injured the rectum, perforated the posterior urethra, ruptured the lateral wall of the bladder, shattered the left pubic bone leaving an opening into the peritoneal cavity, destroyed the left testicle, and amputated the distal half of the penis. Urine drained from the anterior and posterior wounds. (*Case* 35.)

the wounds ascend the urethra this proportion lessens and there is a large increase in the proportion of associated fractures and injuries to the rectum and peritoneal cavity (*Fig.* 505).

Explosive Wounds of the Perineum.—Four ruptures of the urethra were complicated by the so-called 'explosive wounds' of the perineum (*Cases* 7, 27, 32, 39). In these patients a missile had passed either from the anterior abdominal wall or the buttocks down into the perineum and in emerging had burst this region wide open. The effect is most severe when the ischial tuberosity is fractured by the emerging fragment. The resultant wound, which may be 6–8 in. in diameter, appears out of all proportion to the size of the emerging missile. The anus, with a small serrated margin of skin around it, lies drawn up in the centre and is surrounded by gaping perineal and buttock tissues (*Fig.* 506). It would appear as if there may be little hope for survival of the urethra, yet when carefully examined the damage is usually much less severe than is anticipated, for the size of the wound is due more to retraction than to loss of tissue.

A colostomy must be performed immediately to divert the fæces from the wound and a suprapubic

cystostomy established if the urethra is injured. A delayed primary suture with careful repair of the anus, rectum, and urethra should then be carried out as soon as possible. Otherwise the anus remains drawn up and the skin-flaps become fixed in malposition by fibrous tissue, leaving an extensive and rigid wound which is almost impossible to deal with

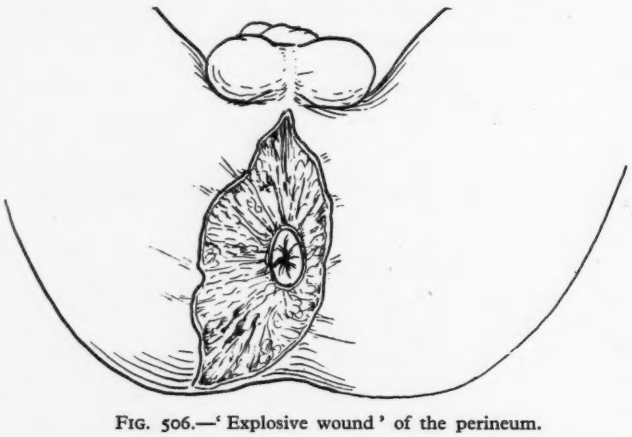

FIG. 506.—'Explosive wound' of the perineum.

by secondary suture. This treatment was carried out on our 4 patients with very satisfactory results. Three had normal micturition restored prior to leaving the Centre and 2 at least are now known to have full rectal control.

Primary Treatment at Forward Surgical Units.—In all but one instance patients reaching the Genito-Urinary Centre had received primary surgical treatment. The care with which these patients were treated in busy F.S.U.s and C.C.S.s cannot be commended too highly.

The patients usually presented themselves to the Forward Surgeon as cases of pelvic injuries in which the damage to the urethra might be only one of several major disasters. The primary operation, therefore, commonly ran as follows :—

1. Inspection and toilet of entry and exit wounds.
2. Attempted passage of a catheter.
3. Laparotomy—when an abdominal lesion was suspected.
4. Colostomy when the rectum was injured or large perineal wounds were present.
5. Suprapubic cystostomy when injuries to the bladder and urethra were present.

The standard of diagnosis was high in the Forward Areas, and in the vast majority of patients the urethral lesion had been noticed at the primary operation. Suprapubic cystostomy was almost invariably used to divert the urine from the urethra. In a few patients perurethral catheter drainage was employed. An exact review of the primary operations shows :—

Suprapubic cystostomy performed at primary operation	40	53
Suprapubic cystostomy performed at early secondary operation	3	
Bladder drained by indwelling urethral catheter (all required a subsequent cystostomy)	3	
No diversion of urine from urethra	3	
Primary treatment unknown (Jugo-Slav patients)	4	

The suprapubic cystostomies were usually placed well above the pubis and the Malecot catheter had been brought out along an oblique track. Little trouble was seen from leakage around the catheter and no cases of subsequent extravasation were noted. These patients travelled extremely well and practically no trouble was experienced from blockage of the catheter or displacement in transit. The patients with an indwelling catheter were not so fortunate, as these catheters usually either became blocked or were lost in transit.

There can be no doubt that in Forward Areas drainage of the bladder should always be carried out by suprapubic cystostomy. No matter how great the merits of the indwelling urethral catheter in civilian or quiet hospital life, it has no position in Forward Surgery as regards bladder drainage. It may, however, be employed as a urethral splint in conjunction with suprapubic drainage.

Few attempts were made at the primary operation to repair the urethra. When the posterior urethra was damaged, however, an indwelling catheter was frequently fixed in position to act as a splint and prevent any loss of urethral alinement.

The following table shows the various reparative procedures carried out at primary or early secondary operations :—

1. No urethral repair	29	53
2. Indwelling urethral catheter fixed in position at primary operation	12	
3. Indwelling urethral catheter fixed in position at early secondary operation	1	
4. Suture urethra	6	
5. Amputation penis	1	
6. Primary treatment not known (Jugo-Slav patients).	4	

TREATMENT AT GENITO-URINARY CENTRE

General.—The patients on the whole travelled back to the Genito-Urinary Centre extremely well. Of those patients on whom the primary operation had been confined to débridement of the wounds and the establishment of suprapubic drainage, almost all reached the Centre in good time and no cause for regret in advocating this policy was encountered. Forward Surgeons also showed an admirable judgement in their treatment of those patients whom they were unable to evacuate at an early date.

Following the admission of the patient an appraisal of the nature of his wounds and previous treatment was made from his notes and when necessary further X-ray examinations were made to determine the presence of foreign bodies or fractures of the pelvis. A complete survey of the patient's wounds was subsequently made in the theatre. At this examination it frequently became apparent that the injuries to the urethra were less severe than had appeared at the primary operation and that ruptures, which had been believed to be complete, were in fact partial. It was often impossible to pass an ordinary straight rubber catheter through the urethra, but if a coudé rubber catheter was used and if it was gently manipulated so that its passage was attempted with its point towards various aspects of the urethral wall, then frequently a site was found where it ran onwards into the bladder and

demonstrated that the continuity of the urethra was not completely broken. When the lesions were of a relatively minor type any necessary repairs or sutures were carried out immediately. If the wounds, however, were severe, and extensive exploration or plastic repairs were necessary, then further operation was frequently deferred until a course of parenteral penicillin and sulphonamide had been commenced and the patient generally prepared for a long and difficult operation.

Extravasation.—Only 2 cases of true extravasation of urine have been seen and they were not of a very serious nature. The gross extravasations, associated with sloughing and gangrene of the tissues, and frequently the presence of gas-forming organisms, reported in the world war of 1914–18, have not been seen.

Three factors probably account for this satisfactory position :—

1. Retention of urine normally follows an injury to the urethra. The patient is unable to micturate. It is only when the bladder, if unrelieved, finally overflows that extravasation occurs.

2. Forward Surgeons have almost always carried out a suprapubic cystostomy long before this critical point is reached.

3. The routine administration of the sulphonamide drugs has helped to keep the urine sterile.

In the literature most accounts of extravasation of urine are based on records of flooding of the tissues with heavily infected urine following the rupture of a periurethral abscess behind a stricture. Sterile urine, such as is normally poured forth in a war wound, is not particularly irritating to the tissues. It is mainly when the wound becomes infected, and especially if the urine cannot drain away, that extravasation becomes dangerous.

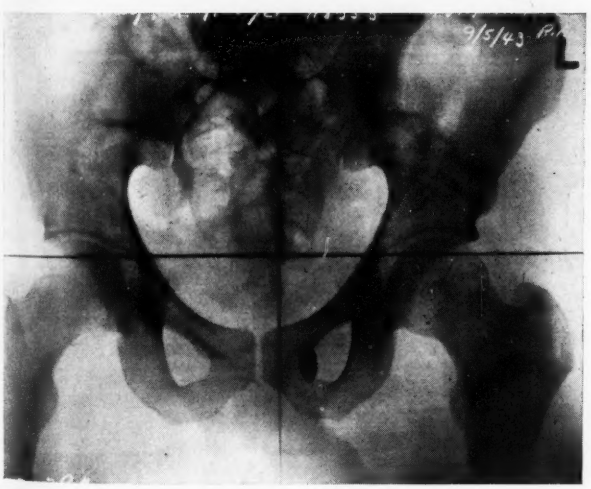

FIG. 507.—A Sten-gun bullet entered the right thigh, injuring the head of the left femur and acetabulum, crossed the pelvis, rupturing the prostatic urethra, and finally came to rest just exterior to the left obturator membrane. The position of the bullet was accurately localized by stereoscopic radiographs. (*Case* 2.)

Localization of Foreign Bodies in the Pelvis.—The exact localization of foreign bodies in the pelvis is often difficult, and yet, if unnecessary trauma is to be avoided, one must have an exact conception of the relation of the foreign body to the pelvic walls and floor. With Field X-ray sets it was often difficult to obtain good lateral pictures of the pelvis. Stereoscopic pictures, however, proved of great value and were, moreover, taken with much less disturbance to the patient. Seen through the small viewing binoculars they gave a three-dimensional picture of the position of a foreign body in the pelvis which was difficult to reconstruct from anteroposterior and lateral views (*Fig.* 507).

Occasionally a urethrogram may be extremely helpful in localizing a foreign body. Its use, however, is limited to chronic cases. A piece of shrapnel lying in the pelvic diaphragm and communicating with the urethra was localized exactly by this method and removed by a perineal approach (*Fig.* 508).

FIG. 508.—A piece of shrapnel entered the pelvis through a wound in the left groin. No lesion of the urethra was noted. A chronic urethritis developed. A urethrogram ultimately showed a foreign body lying in the pelvic diaphragm and communicating with the urethra through a small opening. (*Case* 3.)

Delayed Primary Suture.—The principles of delayed primary suture hold for perineal wounds involving the urethra. It is most desirable to avoid large granulating wounds in the perineum as the subsequent fibrosis renders all the tissues rigid and in the event of a urethral repair being unsatisfactory makes subsequent operations extremely difficult. Using parenteral and irrigation penicillin, almost all perineal wounds were closed. The impression was gained that the urethra healed with less fibrous-tissue formation, that less scarring occurred in the perineum, and that osteomyelitis of the pelvic bones was often avoided by covering over compound fractures of the ischium.

RUPTURES OF THE PENILE URETHRA

Fourteen patients had sustained injuries to the penile urethra. The following table shows the types of lesion encountered :—

Partial Rupture (8 Cases)	Glans penis	2
	Glans and body of penis	1
	Body of penis	5
Complete Ruptures (6 cases)	Traumatic Amputation	2
	Others	4
Associated Injuries :		
Perforation rectum—Colostomy		2
Fracture pelvis		3
Fracture femur		2
Loss of testis		7

In all but three patients the missile traversed the penis in a transverse or slightly oblique direction causing a tangential or through-and-through wound. On two occasions (*Cases* 7, 8) it entered the penis in the region of the glans, passed down the length of the body of the penis, injuring the urethra in its course, and then travelled on into the perineum or pelvis. In only one instance did a foreign body lodge in the penis.

Partial Rupture.—The partial ruptures of the urethra were mainly caused by small missiles. With one exception all had a suprapubic cystostomy performed to divert the urine from the urethra.

Of the 3 cases of injury to the glans and adjacent body of the penis 2 required plastic repairs. One healed completely ; in the other a minute urinary fistula persisted on the under-surface of the penis.

Of the 5 patients suffering from wounds of the shaft of the penis it had been found impossible to catheterize 2 cases at Forward Units. With careful manipulation, however, it was found possible to pass a catheter and the partial continuity of the urethra was thus proven. One of the earliest of these patients was treated with an indwelling catheter as a splint. This treatment was, however, later abandoned, and once continuity of the urethra had been demonstrated no catheter was left in position and no further treatment was given except the occasional passage of a sound to ensure that a stricture did not form. In no case was the urethra sutured. Secondary suture of the skin was carried out in 3 patients (*Cases* 7, 8, and 50).

Complete Ruptures.—In 2 patients (*Cases* 20 and 33) traumatic amputation of the penis had occurred. In each instance the penis had been cut across about 1 in. distal to the pubis and the skin torn away from the remaining stump up to the level of the pubis. Both cases were complicated by severe adjoining wounds of the left groin and in 1 case the posterior urethra and bladder were also injured. It was evident in each case that if the remaining stump was not covered with skin gross fibrosis and retraction would occur and render the organ practically useless. In both patients the adjoining injuries rendered immediate grafting impossible, and it was several weeks before they were fit for treatment. By this time considerable retraction had occurred and the stump of the penis in each instance required mobilization from a bed of granulation tissue. The stump of the penis was then covered by a pedicle skin-flap cut from the scrotum (*Fig.* 509). One case was completely successful and before returning to the United Kingdom was able to use his penis to micturate

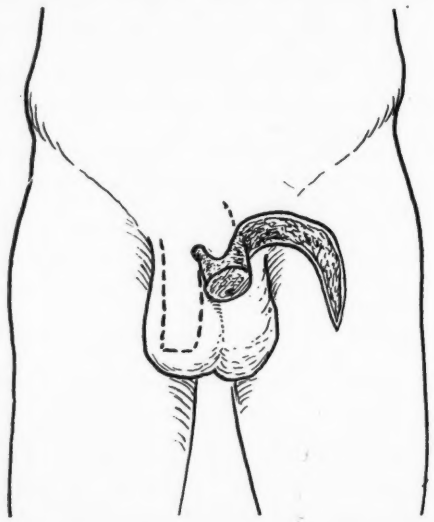

FIG. 509.—Traumatic amputation of the penis. The dotted lines show the incisions for the plastic flaps. (*Case* 20.)

through the fly of the trousers. This patient has since informed me that he has full control of micturition. In addition, erections of the penile stump occur and intercourse is possible. In his own words he describes the act as " I have no feeling during the functioning of the penis, but feel the coming of the semen ". In the second patient the scrotal flap was cut a little too narrow at its base and some terminal necrosis occurred. He, however, now has full control of micturition from the stump. Erections occur, but owing to the severe injuries in the left groin the penile stump becomes drawn over to the left side. These two patients admirably illustrate the observation of Hugh Young during the first world war that " even though the penis may be lost almost up to the penoscrotal juncture, it is a remarkable fact that on erection it may project sufficiently far to allow of sexual intercourse and satisfactory ejaculation ".

Two of the remaining 4 cases of complete rupture of the penile urethra were complicated by gross penile damage (*Cases* 23 and 38). In 1 patient it was possible to pass a finger completely through the penis. At the Field Surgical Unit it was felt that the distal portion would inevitably become gangrenous, but it was wisely decided to leave it attached. This soldier was seen on the fourth day after injury. His wound was clean. The ends of the urethra were found and mobilized and a complete suture performed around a catheter arranged for penicillin irrigation (*see* PENICILLIN, p. 375). The corpora cavernosa penis were repaired as far as possible and the subcutaneous tissue and skin sutured. Complete healing, except for a minute sinus leaking about five drops of urine per act of micturition, was obtained. The other case of complete rupture was also treated by suture of the urethra and delayed primary suture of the cutaneous wounds with complete success.

The two remaining instances of complete rupture were fairly old injuries in two Jugo-Slav Partisans (*Cases* 41 and 43). One patient, a charming boy of 15 years, had sustained a wound of the penis resulting in complete occlusion of the urethra. He had been draining by the suprapubic route for over a year. Complete excision of the fibrous occluded section was carried out and full normal micturition restored. The second Jugo-Slav patient had also sustained a through-and-through wound of the penis, which had resulted in occlusion of the urethra. Attempts had been made to restore continuity, but had resulted in a penoscrotal fistula. It was evident that to close the fistula and restore continuity a large block of fibrous tissue would have to be excised, and the cut ends of the urethra united. The operation was extremely difficult. During the removal of the fibrous tissue two apparent proximal extremities of the urethra were found. Bougies passed up each tube ran into the bladder and a bougie passed from the bladder could be made to enter each track. Finally the more dorsally placed and larger urethra was used for the repair. The other tube was followed backwards and joined the apparent true urethra in the posterior bulbous region. This tube was removed and the end invaginated and sewn over. The remaining ends of the urethra were then sutured and a completely successful result obtained. A subsequent urethrogram showed the point at which the reduplication or diverticulum of the urethra came off (*Fig.* 510).

FIG. 510.—Urethrogram showing a slight sacculated point, from which an apparent duplication of the urethra came off and was removed (*see* text). (*Case* 43.)

Immediate Results.—

1. R.T.U. (Cat. B.1.)—normal micturition	2	14 cases
2. Invalided home—micturition normal	7	
3. Invalided home—minute urethral sinus, micturition otherwise normal	2	
4. Invalided home—suprapubic cystoscopy	3	

Complete continuity of the urethra had been obtained in each of the 3 patients evacuated home with a suprapubic tube in position. There were also no remaining urethral sinuses. A change in location of the Genito-Urinary Centre made it necessary to evacuate these patients before treatment was complete.

RUPTURE OF THE BULBOUS URETHRA

Twenty-five patients suffering from ruptures of the bulbous urethra have been treated and are classified as follows :—

Contusion urethra	3	25 lesions
Partial rupture	16	
Complete rupture	6	
Associated Injuries :		
Peritoneal cavity perforated		2
Perforated rectum		4
Colostomies		8
Fracture pelvis		4
Loss of testis		10
Injured testis		3

Contusion of the urethra was diagnosed when following a wound in the region of the urethra retention or urethral bleeding occurred but no difficulty was experienced in passing a catheter and no perforation of the urethra was demonstrated in the adjacent wound. In 2 of the 3 cases there were extensive groin and perineal wounds. In one of them (*Case* 5) the right corpus cavernosum penis had been partially destroyed and the urethra could be seen lying intact, but bruised, in the bottom of the wound. This wound was closed with penicillin irrigation in an attempt to stop the onset of infection and possibly necrosis of the urethra. The treatment proved successful. At a later date an extensive plastic repair of the penis was performed.

Partial Rupture.—Sixteen partial ruptures of the urethra were treated and were mainly caused by projectiles passing anteroposteriorly across the perineum. A few were due to mine and shell wounds, which entered the perineum from below. Apart from the passage of a catheter to demonstrate the continuity of the urethra, 11 patients required no operative treatment on the urethra. Removal of foreign bodies and delayed primary suture of perineal wounds were, however, carried out. In 5 instances repairs of the urethra were performed. It is noteworthy that in 8 of these 16 partial ruptures it has been found impossible to pass a catheter at the original operation carried out at a Forward Unit and that in 5 of these patients no further urethral operation was eventually found necessary.

Complete Rupture.—Six cases of complete rupture of the bulbous urethra have been treated. One patient (*Case* 45), who was suffering from multiple injuries and a complete occlusion of the urethra, died from infective jaundice before any repair was attempted. Of the remaining 5 cases 2 had undergone unsuccessful repairs before admission to the Centre (*Cases* 35, 53), and required further operative treatment; the other 3 had complete repairs of the urethra carried out. It has so far always been possible to mobilize the ends of the urethra, after the manner of Marion, sufficiently to bring them together and to obtain complete suture.

The technique of bridging a gap with an indwelling catheter and leaving the perineal wound to granulate over has never been resorted to. The perineal wounds have all been closed, but a penicillin irrigation tube has frequently been left in position. Young's technique of closing large gaps in the bulbous urethra by liberating the attachments of the penis within the scrotum and drawing the corpora cavernosa and spongiosum backwards has never been employed. It is, however, noteworthy that Young claims that gaps of even 4 in. can be closed by this means. Likewise the method of Pasteur and Iselin has not been used.

One of these patients was of particular interest (*Case* 1) as half the scrotum had been carried away and the bulbous urethra and corpora cavernosa penis were completely divided in the perineum (*Fig.* 511). The distal portal of the penis remained

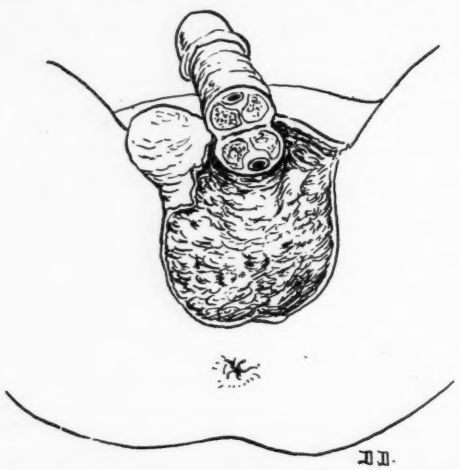

FIG. 511.—Missile injury of the perineum. The bulbous urethra and the corpora cavernosa penis were completely divided. The distal portion of the penis remained attached by a dorsolateral skin-flap containing the dorsal arteries and veins of the penis. (*Case* 7.)

attached by a dorsolateral skin-flap containing the dorsal arteries and veins of the penis. An attempt had been made to unite the divided penis at a Forward Unit, but the wound had become septic and had broken down completely. The distal portion of the penis was viable. After the wound had been cleaned the divided ends of the penis were defined out of a mass of granulation tissue and complete suture of the corpora cavernosa penis and the bulbous urethra was performed. Union occurred, but a small fistulous track leading down to the suture line remained at the time of evacuation to the United Kingdom.

Immediate Results.—

Died	1	25
R.T.U. (Cat. B.1.)—normal micturition	6	
Invalided home—normal micturition	12	
Invalided home—minute urethral fistula, micturition otherwise normal	2	
Invalided home—suprapubic cystostomy	4	

Of the 4 patients sent home with a suprapubic tube in position, 2 were evacuated when the Genito-Urinary Centre closed as the perineal wounds were not completely dry. The third, a Canadian who had suffered from an ' explosive wound ' of the perineum with ruptures of the bulbous and posterior urethra, had complete continuity of his urethra but the perineal wound was not completely healed. The fourth had undergone an unsuccessful repair elsewhere and was suffering from a urethral fistula, bilateral pyelonephritis, chronic cystitis, and osteomyelitis of the pelvis (*Case* 53). He remains under my care in England and is improving.

RUPTURE OF THE PROSTATO-MEMBRANOUS URETHRA

Sixteen ruptures of the posterior urethra have been treated. The injury may involve any portion of the urethra, but for classification they may be grouped into :—

1. Injuries involving the bladder neck and the proximal portion of the prostatic urethra.
2. Injuries to the body of the prostate.
3. Injuries to the region of the membranous urethra.

A catheter can seldom be passed in these patients and it is therefore impossible to divide them satisfactorily into partial and complete ruptures. There is, however, little doubt that in many the continuity of the urethra is not completely broken. The wounds of the membranous urethra are the most dangerous from the point of view of stricture formation. Complete ruptures at the junction of the prostatic and membranous urethra, with posterior dislocation of the prostate on the urogenital diaphragm, such as occur in severe traumatic fractures of the pelvis in civil life, are rare.

The rectum has been injured on 6 occasions but only 2 prostato-rectal fistulæ have failed to close spontaneously and have required separation and closure.

The danger of stricture formation in the region of the membranous urethra, and the great difficulty of treating this condition satisfactorily at a later date, have led me invariably to use an indwelling urethral catheter as a splint. It is probable that this is unnecessary in many wounds involving the bladder neck or body of the prostate, and that the rigidity of the remaining prostatic wall is sufficient to prevent the ends of the urethra getting out of alinement. Nevertheless the difficulty of estimating the exact extent of the wound and the seriousness of an unsuccessful outcome seem to make an indwelling catheter imperative.

Two methods have been used to introduce the indwelling catheter :—

1. In the first method a finger is passed down into the posterior urethra and it is then frequently possible to guide the tip of a Lister's sound, which has been passed down the anterior urethra, into the bladder. The distal end of a small rubber catheter is then slipped over the tip of the sound so that it grips firmly and the catheter is drawn through the urethra by withdrawing the sound.

2. In the more difficult cases, where the rupture is in the region of the membranous urethra, two Lister's sounds are used, the tip of one of which has been slightly hollowed out so as to form a cup in which the tip of the other may engage. The female sound is passed through the internal urethral orifice and the plain one down the anterior urethra.

The two sounds are gently manipulated until the points engage. These are then held firmly together, whilst the distal sound is carried forwards into the bladder. The distal end of a rubber catheter is then slipped over its tip and drawn back down the urethra. These two methods have always been successful and no perineal explorations have been necessary. In addition the operation can frequently be carried out by slipping a finger down the suprapubic track and it is seldom necessary to reopen the suprapubic wound entirely (*Fig.* 512).

The indwelling catheter is held in position by a stitch through its tip, which is brought out alongside the suprapubic Malecot catheter and tied to a piece of rubber tubing on the abdominal wall. This technique also ensures that subsequent catheters can, if necessary, be drawn through the urethra. The catheter is not really for use as a drain but as a urethral splint. Prior to introduction a piece of thread is tied around the catheter immediately distal to the eye. This prevents drainage down the catheter and allows of one less tube to be attached to a bottle during evacuation. If the catheter is not draining, it is also easier to keep the catheter and urethra sterile, as the whole of the perineum and penis can be covered over with sterile dressings. This catheter is also frequently used for penicillin irrigation (*Fig.* 513).

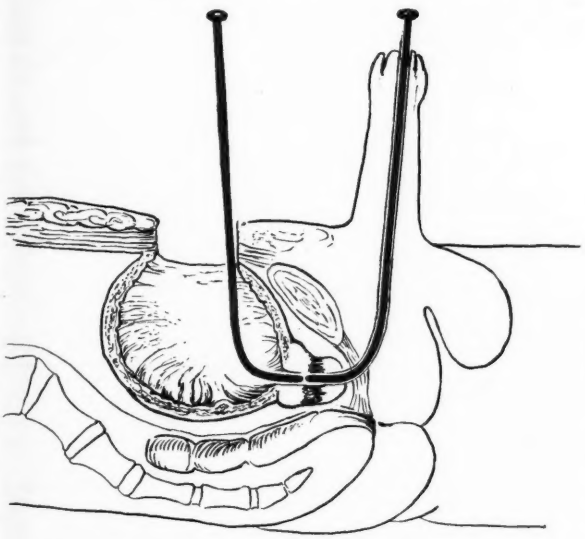

FIG. 512.—Method of introducing a catheter through the ruptured posterior urethra using two Lister's sounds, one of which has been slightly hollowed out at the tip so as to form a cup in which the tip of the other may engage.

The urethral catheter is left in position for at least two weeks so as to ensure firm fixation of the ends of the urethra.

In 2 patients prostato-rectal fistulæ required separation. An inverted-V perineal incision was made and separation of the rectum and prostate carried out to a level well above that of the fistula. The fistula in the posterior margin of the prostate was then sutured and the rectal opening invaginated and oversewn with two layers of sutures. The perineum was closed with a small penicillin irrigation tube in position.

Immediate Results.—

Died	1
R.T.U.	1
Invalided home—normal micturition	10
Invalided home—suprapubic cystostomy	4

GENERAL OBSERVATIONS ON TREATMENT

1. Technique of Repair of Urethra.—Most surgeons are relatively inexperienced in perineal operating and a fairly considerable apprenticeship is necessary to learn the art of urethral repair. The importance of an unhurried operation, good anatomical exposure, and the maintenance of as bloodless a field as possible cannot be overstressed. Adequate mobilization of the divided urethra so that its ends can be brought together without tension must always be obtained. Apposition is maintained by a series of plain interrupted 6–0 catgut sutures which completely encircle the urethra. The urethra is then covered over by as many layers of subcutaneous tissue as possible. A small rubber-tube drain, which may be used for penicillin irrigation, is placed in the subcutaneous tissues and the skin completely closed.

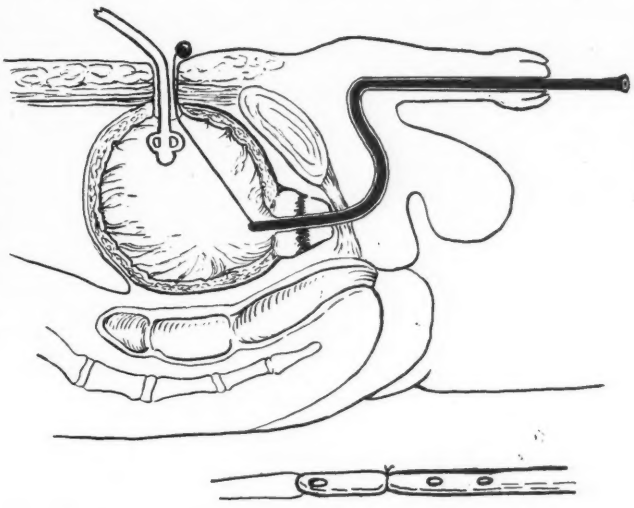

FIG. 513.—Method of fixing a urethral catheter as a urethral splint. The inset shows a catheter arranged for penicillin irrigation.

2. The Use of the Indwelling Catheter.—In the early days an indwelling urethral catheter was fairly frequently used to splint wounds of the penile and bulbous urethræ following repair. The presence of a foreign body in the urethra must, however, retard healing to some extent, and gradually the use of this urethral splint was abandoned and reliance placed entirely on a careful repair of the urethra. An indwelling catheter might be used during the operation of suturing two ends of the urethra together, but once this was completed it was withdrawn.

For wounds of the posterior urethra the indwelling catheter forms an admirable splint. A small size is used (15 Ch.) so as to permit free drainage down the urethra around it. Catheters may also be used for penicillin irrigation.

Table I.—MISSILE INJURIES OF THE URETHRA

CASE NO. AND INITIALS	FINAL DIAGNOSIS	TYPE OF INJURY	COMPLICATIONS	RESULT IN C.M.F.	FOLLOW-UP	
					Micturition	Sexual Function
1. J. W.	Complete rupture bulbous urethra	Shell wound T-and-T L. groin and perineum	Large perineal wound. Corpora cavernosa penis and urethra completely divided	Minute urethral fistula. Invalided U.K.	Micturition normal. No treatment	Slight subnormal erection. Emission normal
2. A. O.	Rupture posterior urethra	Penetrating G.S.W. (sten-gun) R. thigh	Injury head R. femur and acetabulum	Died	—	—
3. C. F.	Rupture posterior urethra	Penetrating shell wound of pubic region	Piece of shell lodged in pelvic diaphragm. R. orchidectomy	Micturition normal. Invalided U.K.	—	—
4. S.	Contusion bulbous urethra	Penetrating machine-gun wound of L. hip region	Fracture R. femur	Micturition normal. Invalided U.K.	—	—
5. I. G.	Contusion bulbous urethra	Machine-gun wounds R. groin and penis	R. cord and crus divided. R. orchidectomy	Micturition normal. R.T.U.	—	—
6. A. L.	Rupture posterior urethra. (Base of bladder and prostate)	T-and-T tommy-gun wound of pelvis	Rectum injured. Colostomy. Fractures of pelvis and sacrum	Micturition normal. Invalided U.K.	Micturition normal	Incomplete erection. Chordee to right. Emission stated to occur
7. T. S.	Partial rupture penile urethra	T-and-T mortar-bomb wound from glans penis to perineum	'Explosive wound' perineum. Colostomy. Fracture pelvis	Micturition normal. Invalided U.K.	Micturition normal. Lacks full control anus. Colostomy closed	Erection and emission normal
8. P. W.	Partial rupture penile urethra	Penetrating shell wound of penis and pelvis	—	Micturition normal. R.T.U. (Cat. B.1.)	Micturition normal	Erection, emission and intercourse normal
9. J.	Contusion bulbous urethra	T-and-T shell wound from L. groin to perineum	L. orchidectomy	Micturition normal. R.T.U. (Cat. B.1.)	—	—
10. W.	Partial rupture bulbous urethra	G.S.W. perineum	—	Micturition normal. R.T.U. (Cat. B.1.)	—	—
11. L. M.	Partial rupture penile urethra	T-and-T mine wound of penis and scrotum	L. orchidectomy	Micturition normal. R.T.U. (Cat. B.1.)	—	—
12. R. N.	Rupture posterior urethra	Penetrating shell wound of sacral region	Wound of rectum —colostomy. Fractures of sacrum and pubis. Osteomyelitis pubis	Micturition normal. Invalided U.K.	—	—
13. W. K.	Partial rupture bulbous urethra	Penetrating wound R. groin	R. orchidectomy	Micturition normal. Invalided India	—	—
14. J. C.	Partial rupture bulbous urethra	Penetrating mortar-bomb wounds of buttock	Injury rectum. Colostomy	Micturition normal. Invalided U.K.	—	—
15 S. K.	Rupture posterior urethra	Penetrating transverse tommy-gun wounds of R. hip region	Fracture R. great trochanter. Fracture L. pubis	Micturition normal. R.T.U. (Cat. B.1.)	—	—
16. J. S.	Partial rupture bulbous urethra	T-and-T shell wound from base of penis to R. buttock	Very severe multiple shell wounds of arms and legs	Micturition normal. R.T.U. (Cat. B.1.)	—	—
17. R. B.	Partial rupture bulbous urethra	Penetrating shell wound of L. scrotal region	—	Micturition normal. R.T.U. (Cat. B.1.)	—	—
18. P. G.	Partial rupture bulbous urethra	Booby-trap wounds of perineum	R. foot blown off. Testicles very severely damaged	Micturition normal. Invalided U.K.	Micturition normal	Occasional erection and emission. Takes methyl testosterone
19. C. A.	Rupture posterior urethra	T-and-T wounds buttocks	Fracture R. ischial ramus	Micturition normal. Invalided U.K.	—	—
20. J. S.	Complete rupture penile urethra. Traumatic amputation penis	Shell wound penis and L. groin	L. testis destroyed	Micturition normal from stump of penis. Invalided U.K.	Micturition normal. No dilatation	Erection and emission occur. No penile sensation during intercourse, but recognizes emission.

Table I.—MISSILE INJURIES OF THE URETHRA, *continued*

CASE NO. AND INITIALS	FINAL DIAGNOSIS	TYPE OF INJURY	COMPLICATIONS	RESULT IN C.M.F.	FOLLOW-UP	
					Micturition	Sexual Function
21. D. B.	Rupture posterior urethra	T-and-T revolver bullet wound of pelvis	Rectum injured—colostomy	Micturition normal. Invalided Canada	—	—
22. W. T.	Partial rupture bulbous urethra	Mortar-bomb wound of perineum	—	Micturition normal. R.T.U. (Cat. B.1.)	—	—
23. J. R.	Complete rupture penile urethra	T-and-T shell wound of pelvis	R. orchidectomy	Small urethral fistula. Invalided home	Micturition normal apart from presence of small fistula, attempted closure failed	Erection not very firm. Emission normal.
24. A. B.	Partial rupture penile urethra	Penetrating mortar-bomb wound L. thigh finally lodging in glans penis	L. orchidectomy	Minute urethral sinus. Invalided U.K.	—	—
25. J. W.	Rupture posterior urethra	T-and-T machine-gun wound penetrating from L. buttock to suprapubic region	Extravasation. Fracture pubis. Chronic osteomyelitis pubis. L. corpus cavernosum grossly damaged	Micturition normal. Invalided U.K.	Micturition normal	Dorsal chordee. Emission normal
26. W. D.	Partial rupture penile urethra	Penetrating shell wound penis, scrotum, and R. thigh	—	Micturition normal. Invalided U.K.	Micturition normal. Dilatation	Erection and emission normal
27. N. A. W.	1. Partial rupture bulbous urethra 2. Rupture posterior urethra	Multiple shell wounds of sacral region and perineum	'Explosive wound' perineum. Fractures pelvis and L. great trochanter. Colostomy. R. orchidectomy	Invalided to Canada with suprapubic drain	—	—
28. A. J. B.	Rupture posterior urethra	Penetrating shell wound from L. groin to R. buttock	Fracture L. pubis. Colostomy	Micturition normal. Invalided U.K.	Micturition normal. Colostomy closed	Erections unsatisfactory and painful. Emission occurs
29. A. B.	Rupture posterior urethra	Penetrating shell wound from L. buttock to R. groin	Fracture R. pubis	Micturition normal. Invalided U.K.	—	—
30. J. R.	Partial rupture bulbous urethra	Shell wounds perineum and L. buttock	Anus injured. Colostomy	Micturition normal. Invalided U.K.	Micturition normal. No dilatation	Erection and emission normal
31. A. A.	Complete rupture bulbous urethra	T-and-T shell wound from R. buttock to L. groin	Rectum injured. Colostomy. L. orchidectomy	Suprapubic drain. Invalided U.K.	Micturition normal apart from slight dribbling if urine held for a long time. Suprapubic and colostomy closed	Erection and emission normal. Slight burning pain during intercourse
32. D. S.	Rupture posterior urethra. Rupture bladder	T-and-T machine-gun wound from abdomen to perineum	'Explosive wound' perineum. Rectum injured. Colostomy	Micturition normal. Invalided U.K.	Micturition normal. Colostomy closed. Anus not very tight. Some sphincter action	—
33. C. D.	1. Traumatic amputation penile urethra. 2. Rupture posterior urethra 3. Rupture bladder	T-and-T G.S.W. from sacral region to L. pubic region	Injury rectum. Colostomy. Fracture pelvis. Osteomyelitis pubis. L. testis destroyed	Suprapubic cystostomy. Invalided U.K.	Micturition normal from stump of penis. Colostomy closed	Erections occur, but penile stump is pulled over to left side
34. D.	Partial rupture penile urethra	T-and-T machine-gun wound penis	R. testis atrophic	Micturition normal. Invalided U.K.	—	—
35. A.	Complete rupture bulbous urethra. Rupture bladder	Penetrating machine-gun wound L. pubic region	Fracture pubis. Osteomyelitis. Resection 6 in. ilium. Injury rectum. L. testis injured	Minute urethral fistula. Invalided India	—	—
36. C.	Partial rupture penile urethra	T-and-T shell wound from base of penis to perineum	—	Suprapubic cystostomy. Invlided U.K.	—	—
37. J.	Rupture posterior urethra	Penetrating wound L. buttock	Injury rectum. Colostomy	Micturition normal. Invalided India	—	—

MISSILE INJURIES OF THE URETHRA, *continued*

CASE NO. AND INITIALS	FINAL DIAGNOSIS	TYPE OF INJURY	COMPLICATIONS	RESULT IN C.M.F.	FOLLOW-UP	
					Micturition	Sexual Function
38. R.	Complete rupture penile urethra	T-and-T machine-gun wound of scrotum	R. orchidectomy	Suprapubic cystostomy. Invalided U.K.	—	—
39. A. R.	Partial rupture bulbous urethra	T-and-T machine-gun wound from root of penis to perineum	'Explosive wound' of perineum. Colostomy	Micturition normal. Invalided U.K.	Micturition normal. No dilatation. Colostomy closed	Erection and emission normal
40. J. B.	Partial rupture bulbous urethra	Grenade wound penetrating R. thigh to perineum	Fracture R. femur	Micturition normal. Invalided U.K.	Micturition normal. Regular dilatation	Erection almost normal. Emission normal
41. L.	Complete rupture penile urethra	Penetrating transverse wound pelvis from L. thigh (injury one year old)	Complete occlusion urethra. Fracture R. femur	Micturition normal. Invalided Jugoslavia	—	—
42. V.	Partial rupture bulbous urethra	T-and-T wound pelvis from L. buttock to R. scrotum (injury one year old)	Large ureteral sinus. R. orchidectomy	Micturition normal. Invalided Jugo-Slavia	—	—
43. M.	Complete rupture penile urethra	Shell wound penile urethra (injury one year old)	Penoscrotal urethral sinus. L. orchidectomy	Micturition normal. Invalided Jugoslavia	—	—
44. P.	Partial rupture bulbous urethra	T-and-T shell wound from R. buttock to L. half of scrotum	Injury rectum. Colostomy. L. testis destroyed	Micturition normal. Invalided Jugo-Slavia	—	—
45. W. H.	Complete rupture bulbous urethra	Multiple mine wounds	Amputation R. leg	Died (Infective) jaundice)	—	—
46. W. S.	Partial rupture bulbous urethra	Shell wound L. buttock	—	Micturition normal. Invalided U.K.	Micturition normal	Erection poor. Emission normal
47. M. O.	Rupture posterior urethra	Penetrating G.S.W. (Spandau) L. thigh	Fracture L. femur and pubis	Suprapubic cystostomy. Invalided U.K.	Micturition normal. Suprapubic cystostomy closed. Dilatation	Erection and emission normal
48. J. W.	Partial rupture bulbous urethra	Multiple mine wounds	Compound fracture skull	Micturition normal. Invalided U.K.	Micturition normal. Regular dilatation	Erection and emission normal
49. A. J.	Complete rupture bulbous urethra	Multiple shell wounds	Testes injured	Micturition normal. Invalided India	—	—
50. M. H.	Partial rupture penile urethra	Multiple G.S.Ws. T-and-T penis	Fracture L. femur	Micturition normal. Invalided India	—	—
51. M.S.	Rupture posterior urethra	Multiple penetrating shell wounds	Injury rectum—colostomy. Fracture L. femur. Suppurative osteoarthritis L. hip-joint. Fracture pubis	Suprapubic cystostomy. Invalided India	—	—
52. D. A.	Partial rupture bulbous urethra	T-and-T rifle wound pelvis	Fracture L. femur. R. sciatic nerve palsy. Paralysis L. common peroneal nerve	Suprapubic cystostomy. Invalided U.K	Micturition normal. Suprapubic cystostomy closed	Erection and emission normal
53. S. H.	Complete rupture bulbous urethra	G.S.W. perineum	Large perineal wound. Fracture L. ischium	Suprapubic cystostomy. Invalided U.K.	Bilateral pyelonephritis. Suprapubic cystostomy present. Urethra patent but fistula still present	—

ABBREVIATIONS: The term "Micturition Normal" in the chart indicates that urination occurs with a full stream through the urethra, that no sinuses are present, that frequency is within normal limits, and control full.
R.T.U. = Returned to unit. T-and-T = Through-and-through.

3. Penicillin.—Penicillin has been extensively used in this series of cases and, as in infected war wounds in other regions, has proved of inestimable value. It is true that *B. coli* is the most common infecting agent in the urinary tract and that it is relatively insensitive to penicillin. The wounds are, however, in addition usually infected with Gram-positive penicillin-sensitive organisms. Penicillin and sulphonamide therapy have therefore often been applied concurrently.

Penicillin therapy has been carried out in three main ways :—

a. Parenteral Penicillin.—When wounds were extensive parenteral penicillin was used. The usual

course of 15,000 units three-hourly for five days was normally employed. It has also been my practice to commence a course of parenteral penicillin twenty-four hours prior to carrying out any extensive perineal sutures or plastic repairs on the urethra.

b. Irrigation Penicillin.—In the closure of dirty perineal wounds irrigation penicillin has been of considerable benefit. The irrigation tube has been introduced through a stab incision and 3·5 c.c. of penicillin diluted to 250 units per c.c. have been gently instilled twice daily.

c. Urethral Application.—It was felt that irrigation of the urethra with penicillin solution might reduce infection and prevent fibrosis. Two methods were employed :—

i. An indwelling catheter is fixed in position as previously described. Prior to introduction a piece of thread is tied around the catheter immediately distal to its eye, so as to prevent any flow of urine down the catheter. A second eye is then cut in the catheter distal to the ligature at whatever level it is desired to flush. Following fixation of the catheter in position irrigation penicillin (5–10 c.c.) was injected down the catheter twice daily and the urethra flushed out. (*See Fig.* 513).

ii. When an indwelling catheter is not in use the urethra has been irrigated with 5–10 c.c. of irrigation penicillin, using a urethral syringe. The solution was held in the urethra for 10 minutes with a urethral clip and then allowed to flow out.

These two methods were extensively used and have seemed of considerable value.

AFTER-TREATMENT

In no form of surgery is good after-treatment more important than in urology. Suprapubic tubes were washed out daily and whenever there was any sign of obstruction they were immediately changed.

Very large perineal dressings were used to keep wounds in this area uninfected. Too often a small pad is placed over a perineal wound and held in position by a flimsy T-bandage, with the result that it comes adrift and the wound lies exposed to infection.

Cessation of Suprapubic Drainage.—No definite time can be laid down for the healing of urethral wounds. Suprapubic drainage should be continued until all perineal and urethral wounds are healed and no urine should pass down the urethra until this time is reached. Too often in records of patients evacuated to the Centre a hopeful note appeared " urine passed down urethra to-day " and the subsequent history showed that this was taken to indicate urethral healing and the time for removal of the suprapubic tube. More often it indicated that the suprapubic tube was blocked.

When the time was due to try the restoration of normal micturition a spigot was placed in the suprapubic tube and the patient encouraged to pass urine through his urethra. If any leakage from the perineal or penile wound occurred then suprapubic drainage was continued ; but if after a day all wounds remained absolutely dry then the suprapubic catheter was removed and the suprapubic wound allowed to heal. Leakage from the suprapubic wound was usually slight, as the track was oblique and the patient had already learnt to micturate. Indwelling catheters were not used to aid the closure of the suprapubic wound, as it is unwise to risk starting even the mildest urethritis.

RESULTS

The following table shows the results obtained in the C.M.F. :—

Died	2	
Returned to duty (Cat. B.1.)	9	
Invalided home—micturition normal	29	53
Invalided home—minute urethral sinus present, otherwise micturition normal	4	
Invalided home—suprapubic cystostomy	9	

It was the original aim of the Centre to endeavour to restore normal micturition before sending the patients home. For various reasons it was, however,

FIG. 514.—Cystogram showing a large funnel-neck deformity of the bladder resulting from a missile injury of the base of the bladder and posterior urethra. (*Case* 6.)

not possible to adhere strictly to this course. Nine patients were evacuated home with suprapubic bladder drainage. In each case, however, the continuity of the urethra had been restored and it seemed probable that normal micturition would ultimately be attained.

At the time of discharge each patient was provided with a card detailing the nature of his urethral injury and advising on the frequency of subsequent urethral dilatation and the type of sound or bougie which had been found most suitable.

LATER RESULTS

The patients who passed through the Centre are now scattered over four continents. In the spring of 1946 an endeavour was made to follow them up.

Replies were eventually received from twenty-three. The results are shown in the table of case records.

Of the patients who had left the Centre with normal micturition, none have since lost this function and no further urethral fistulæ have occurred. Many of the patients were not having regular urethral dilatation, but even so there is as yet no evidence of marked stricture formation.

Of the 9 patients who returned home with suprapubic drainage, 4 are now micturating normally and the suprapubic wounds are closed. One patient, who had a urethral fistula and also osteomyelitis of the pubis, severe cystitis, and chronic bilateral pyelonephritis, is improving and a final repair may yet be possible. The remainder have not been traced.

An attempt has been made to estimate the effect of the urethral injury on sexual function. It is, of course, well known that wounds of the posterior urethra, which destroy the internal sphincter of the bladder and leave a funnel-neck urethra, may cause sterility on account of the emission passing back into the bladder instead of down the urethra (*Fig.* 514). Wounds of the bulbous and penile urethra are those most likely to cause chordee and poor penile erection. The permanent disability due to these latter two complaints has, however, been much less than was expected.

CONCLUSIONS

Following a missile injury of the anterior urethra, if the patient's condition is good and the provision for the operation and after-treatment are adequate then it may often be quite possible and reasonable to carry out suprapubic drainage of the bladder and a complete repair of the urethra at the primary operation. When these conditions do not exist, then suprapubic drainage to divert the urine from the urethra, together with a toilet of any perineal wounds as a primary operation, and a subsequent secondary repair have given excellent results. In some cases the secondary repair may be carried out at the same time as a delayed primary suture of perineal wounds, but no gross harm, apart from the disability of having a suprapubic cystostomy, results from delaying the repair for weeks or even months. In fact it is probable that at times these results may be superior to those obtained by a complete primary operation.

When a missile rupture of the posterior urethra occurs, in addition to instituting suprapubic drainage, it is essential to ensure that alinement of the urethra is restored and maintained by an indwelling urethral catheter at as early a time as possible.

The principles of delayed primary suture hold for perineal wounds involving the urethra. It is most desirable to avoid large granulating wounds in the perineum as they render the tissues rigid, and in the event of a urethral repair being necessary make subsequent operations extremely difficult.

With adequate treatment it is possible to restore normal urinary function in almost all missile injuries of the urethra.

I wish to express my gratitude and indebtedness to Brigadier Harold Edwards for establishing a Genito-Urinary Centre in the C.M.F. and for his help in overcoming many difficulties; and to my colleagues in the C.M.F. who made this work possible by their generosity and help in sending patients to the Centre as rapidly as possible.

My thanks are also due to the staff of the Genito-Urinary Centre for their great loyalty; to Capt. E. I. Jones for his very willing assistance; to the Nursing Sisters for running a large and troublesome Unit often under considerable difficulties; and to my trained medical orderlies, especially Privates Norris and Lunt, for their tireless energy in looking after patients and making sure that catheters were always flowing.

CARCINOMA OF THE RECTUM AND ANAL CANAL TREATMENT WITH VERY HIGH VOLTAGE X-RAY THERAPY

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CARCINOMA of the rectum is one of the few malignant tumours the removal of which by experienced surgeons yields gratifying results—in fact they are among the best in the whole surgical field. Surgery holds undoubted priority in the treatment of early disease, and once the question of operability has been assessed, the indications for surgical removal are absolute. There is no other guarantee to the patient that he will be rid of his otherwise mortal complaint. For many years now the cry has been for early diagnosis, but in spite of our high standard of medical and lay education the early symptoms of a growth mimic so closely the symptoms of benign diseases that its extensions are so often established before the diagnosis is made. We are therefore faced with a large mass of patients left by the surgical 'filter', what Cade (1940) calls "the discards of our surgical wards and the flotsam and jetsam of our incurable wards. In hospital they remain the undisputed province of the radiotherapist. It is one of the richest fields for investigation". The incidence of inoperable growths varies widely in different sites, but about 70 per cent of all patients with malignant disease referred to hospital are unsuitable for curative surgery.

In the particular instance of carcinoma of the rectum, these remarks are emphasized by the following tables:—

Table I.—FIVE-YEAR SURVIVALS IN 716 CASES OPERATED ON AT ST. MARK'S HOSPITAL. (C. DUKES, 1948.)

Limited to rectum	82·0 per cent	All types of operation
Outside rectum, no glands	62·0 per cent	
With local gland metastases	17·4 per cent	Perineal excision
	33·3 per cent	Synchronized combined excision

The results of surgical treatment vary with the type of growth, its anatomical extent, the operation that is performed, and the skill, experience, and judgement of the surgeon. As *Table I* shows, they are better than the results in cancer of the breast. This table, however, is for cases *operated* on. The picture is different if one considers the results in absolute figures of patients referred to hospital.

Table II.—FIVE-YEAR ABSOLUTE SURVIVALS IN 256 CASES REFERRED TO ST. MARK'S HOSPITAL

Total number of cases referred (St. Mark's Hospital)	256	
Resectable	185	= 72·2 per cent
Of these, alive at 5 years	71	
I.e., Absolute survival of operable-palliative resection, and inoperable cases	28	per cent

It will be noted that in this table the term resectable is used. This is because some patients are operated upon and the primary tumour removed in order to rid the patient of symptoms due to the primary growth. The resectability rate at St. Mark's Hospital in 1947 was 86 per cent, with an operative mortality rate of 8·2 per cent. These figures are for carcinoma of the rectum referred to a special hospital where the surgical treatment is in the hands of expert surgeons who have made these diseases and their treatment their life work, and where the standard of surgery is of the highest order. For the country as a whole, the picture is different.

Table III.—B.E.C.C. INVESTIGATION, 1946. (1465 *Cases analysed*)

Radical operation possible in	32	per cent
Number in early stage when good results may be expected	13	per cent
Operative mortality varied from	12	per cent to 52 per cent
Absolute 5-year survival	11	per cent

These figures were obtained from centres all over the country. As they include the St. Mark's Hospital figures, which are outstandingly good, the results in other hospitals may be not as good even as this table shows. Lacassagne (B.E.C.C. Clinical Research Committee Report, 1946) states that in France the absolute survival rate at 5 years for all cases coming to hospital rarely exceeds 12 per cent.

If one accepts the B.E.C.C. figures, the problem of the treatment of carcinoma of the rectum can be expressed thus :—

Table IV.

Referred to hospital	100	cases
Curative surgical treatment possible	30	cases
Cured	12	cases
Will need further treatment other than surgery in order to eradicate the disease	18	cases
Will require primary treatment other than surgery	70	cases

Thus 88 per cent will need some other form of treatment either alone or in conjunction with surgery.

THE PLACE OF COLOSTOMY

Colostomy is of course indicated for all patients who develop intestinal obstruction. As a palliative measure for relief of symptoms due to the primary growth, however, it is being practised less and less. This is indicated by the increased resectability rate at St. Mark's Hospital, which has now reached 86 per cent. The only palliative surgical treatment possible is excision of the rectum, and this may be worth while even in the presence of metastases in the liver and elsewhere. It is true that colostomy may relieve infection and symptoms due to infection, but tenesmus due to tumour mass or mucous discharge and bleeding are not completely relieved. Although long survivals with colostomy alone are known, this operation does not prolong life; of those operated upon, 81 per cent are dead within 18 months (Hartmann, 1928), whilst the average survival of 100 patients with colostomy alone was 16·9 months (Daland, Welch, and Nathanson, 1936).

THE PLACE OF DEEP X-RAY THERAPY AND RADIUM THERAPY IN THE TREATMENT OF CARCINOMA OF THE RECTUM

The treatment of carcinoma of the rectum by X rays generated at 200–250 kilovolts has been abandoned in this country, whilst radium in the form of intrarectal applicators can be used only for tumours which have penetrated less than 2 cm. from the radium source. Eight out of ten major centres in this country inform me that they do not treat carcinoma of the rectum. The reasons were defined by Regaud (quoted by Cade, 1940) :—

1. The tumour cells are scarcely more radiosensitive than the normal mucosa.
2. Good access is difficult.
3. Uniform irradiation is difficult.

To these Cade (1940) adds another—the presence of gross sepsis.

In assessing the results of radiotherapy, Cade records that the five-year survival rate in inoperable cases is 4–8 per cent, a figure similar to that of colostomy alone, but when occasionally primary healing does occur after radiotherapy, the patient is much more comfortable than when treated by colostomy alone. In Sir Charles Gordon Watson's series of operable cases, 11 out of 91 (12 per cent) survived five years, a result very inferior to that of surgery. Bandier (1937) reported 3 patients alive and well after five years out of 125 treated exclusively with X rays. Ralston Paterson (1947) reports 9 patients out of 93 (10 per cent) alive five years and over after radium therapy, whilst none of 13 cases treated by X rays survived this period of time. He adds: "The 10 per cent survival is not important, it is explained by the early case with a small lesion treated by a small radium implantation because concurrent disease made operation inadvisable." Paterson states that no method of radium therapy has been found that is likely to compare with surgery in regard to probability of permanent cure, whilst the employment of high-dosage radiation (X rays) produces an extremely severe and painful reaction without hope of real relief in a sufficient number of cases to justify its exhibition as a routine measure. "Carcinoma recurrent post-operatively cannot successfully be treated by any known radiological method."

Experience at St. Bartholomew's Hospital with the use of high-voltage (200 kv.) X-ray therapy in the treatment of carcinoma of the rectum is similar. Out of a total of 49 cases treated, only 1 survived five years. This patient, treated in 1925, is alive and well after twenty-three years. It was

for these reasons that an investigation was started by Phillips in 1937 into the effect of X rays generated at one million volts.

THE INVESTIGATION

Material.—There were 192 cases available for study, 140 being primary and 52 recurrent after surgical treatment. Of these 22 were in an early operable stage and 128 or 94 per cent had inoperable disease.

Age Incidence.—

	Cases	
20–30	4	Average age, 62 years
31–40	13	
41–50	25	
51–60	45	
61–70	63	
71–80	38	
81–90	4	

The Planning of Treatment.—The patient's general condition must be good to stand a course of treatment which has severe general and local reactions, and it is no easy alternative to surgery. They all experience some degree of the so-called general or constitutional reaction, with lassitude and tiredness, anorexia, nausea and even vomiting, lasting during the whole 4–6 weeks of treatment. Combined with this, after the second week local X-ray reactions in organs lying in the paths of the beams may add to the discomfort of the patient—bladder reactions with radiation cystitis, and colitis and enteritis with tenesmus and diarrhœa. In women the vagina becomes sore and a discharge is set up. The degree and frequency of these reactions varies, but it is uncommon not to meet them in some degree. The blood is affected; the hæmoglobin and red-cell count fall, whilst a leucopenia affecting polymorphs and lymphocytes calls for careful watch on the blood-count. It has been stated that these reactions are less with very high-voltage therapy, but our own experience is that there is not much difference. Some patients stand the course well, others suffer considerably. Lastly, towards the end of treatment, skin reactions set in and persist for 10 to 14 days after completion; the vulva and perineum are more sensitive than other regions of the body and may exhibit erythema, with moist desquamative inflammation.

For all these reasons, treatment in each case has to be carefully planned and executed. The lesion is accurately localized by clinical and radiographic means, a cross-section of the pelvis is taken at this level and the block of tissue to be irradiated is determined and drawn in. X-ray beams are then directed on to this area with the help of isodose charts, and the number and size of the skin portals can be determined. The gain in depth-dose by the use of supervoltage over deep X-ray therapy is considerable, so much so that a given area of the skin may be irradiated, not only by the incident rays of one beam, but also by the emergent rays of other beams. In deep therapy this exit dose due to cross-firing is negligible as it is so small. In supervoltage, however, it may be such that the summated doses of the incident and emergent beams would lead to radio-necrosis. Not only with cross-firing but with angled beams also—especially in the pelvis—the dose where the beams cross-fire may be very high. It is for these reasons that however palliative the treatment is, isodose charts must be drawn out for every patient and one must know what dose each part of the irradiated field is receiving. Having planned the treatment, one must then make certain that each application is carried out as planned. Each set-up must be supervised by a medical officer, special devices such as beam direction, angle indicators, and marks on the skin being used.

The following table gives the number of patients in whom these reactions were severe enough to cause interruption of treatment, together with the late effects due to the treatment received. In necrosis and fistula it was difficult at times to be certain that the disease, i.e., uncontrolled malignant disease, was not at least partly responsible for the condition; also, destruction of neoplastic tissue may leave a gap which the normal tissues, subjected to heavy irradiation, cannot close.

Table V.—Details of Reactions to Supervoltage X-ray Therapy

	Total Cases	Early General Reaction	Blood Changes	Bladder	Late		Fistula	Fibrosis	Necrosis
					Bowel	Pain			
Carcinoma of rectum: Adenocarcinoma	192	7	16	19	24	6	12	32	6
Carcinoma of anus: Squamous-celled	25	0	0	2	0	0	0	2	6

The reactions occurring during treatment can be dealt with—the late ill effects are serious. Pelvic pain, due to involvement of the lumbar and sacral plexus in fibrosis, occurred in 6 cases in which no definite evidence of disease could be found. Fistulæ, mainly rectovaginal, occurred in 12 patients, whilst chronic radiation necrosis developed in 12 patients (out of 217), an incidence of 5·5 per cent. Some of the cases of necrosis were serious, with huge areas of ulceration involving the skin, sacrum, coccyx, and perineum completely beyond the scope of any form of treatment. It was much more frequent in carcinoma of the anus than in carcinoma of the rectum, and in 5 of the 6 patients in the former group it failed to heal. One of these patients, though he has a colostomy and perineo-sacral necrosis, is comfortable and able to continue his work as a city business man. It is never justifiable to risk radiation necrosis in the treatment of benign conditions, but in the treatment of cancer it is a risk which has to be faced. The aim all the time is, of course, to avoid necrosis, for it can be due to improper radiotherapy,

but in spite of the most meticulous planning and execution of treatment it still occurs, as patients vary, tissues vary, blood-vessels vary. Radiation necrosis affects the surface tissues which of necessity receive the highest doses, and the wound is plain for all the world to see—horrible in its appearance, painful, and with foul ulceration resulting in chronic invalidism. Sometimes the patient seems worse off than if he had been left to die from the cancer, his existence being prolonged but also his sufferings. It is a hazard which has to be faced, the same as the morbidity and mortality of surgical treatment.

Fibrosis.—By this is meant a sufficient degree of fibrosis to produce a stricture of the anal canal or rectum, necessitating a colostomy. It developed in some patients who already had obstruction due to the neoplasm, and who already had a colostomy. Following X-ray therapy, the whole bowel wall becomes fibrosed. This reaction affects the blood-vessels as well, resulting in endarteritis obliterans, which further increases the fibrosis in the bowel wall. A dense rigid stricture is formed in which no mucosa can be recognized, and as time passes it becomes more firm and the stricture orifice smaller. It occurs most often at the site of the neoplasm, due to the destruction of the growth and its replacement by granulation tissue which becomes fibrous tissue, progressively contracting as time passes. It may, however, develop in an irradiated normal anal canal, below a carcinoma of the rectum.

RESULTS

Carcinoma of the Rectum (Adenocarcinoma).—A total of 192 patients were treated up to the end of 1946.

Classified into stages on clinical examination they fall into the following groups :—

		Alive
Stage 1.—Confined to mucosa	4	1
Stage 2.—Involving the whole bowel wall or having local pelvic metastases, or both	18	1
Stage 3.—Fixed to pelvic tissues	106	10
Stage 4.—Distant metastases	12	0
Recurrent cases	52	12
Total	192	24

Alive	24
Known dead	166
Untraced, presumed dead	2

Of all cases 94 per cent were therefore in an advanced stage or had recurrent disease before treatment.

Alive.—

Stage 1 : (Woman, 68). 1 case. This is a recent case, a polypoid carcinoma in the ampulla. There has been complete disappearance of the primary growth, and she has so far not needed a colostomy. (2½ years.)

Stage 2 : (Man, 79.) 1 case. Remains well for 3½ years. This man has a colostomy and has a hard mass in the rectal wall, presumably with slowly advancing growth present.

Stages 3 and 4 : 10 of these are alive and well for the following periods :—

10 years : A woman aged 41 when treated. Colostomy and laparotomy, 1938, revealed a fixed growth with glandular metastases. A dose of 5000 r in 39 days was well tolerated. Three years later the colostomy was closed. She remains well to date, 10 years later. There is a slight stricture at the site of the lesion and she has an irritable bladder with telangiectasia of the mucosa, but is quite comfortable. The growth was an adenocarcinoma.

Of the remainder, 1 is alive after 2½ years, 4 after 3½ years, 3 after 5 years, and 1 after 6 years.

To summarize, out of 140 primary cases, 128 are dead and 12 alive, 2 two years, 5 three years, 3 five years, 1 six years, and 1 10 years after treatment. Six are perfectly well and free from symptoms, 2 have growth probably still present, and the rest are too recent, but are comfortable and free of complications. One has a necrosis leading down to the coccyx. We have been unable to trace only 2 patients, and these are presumed dead in the first six months after treatment. The survival rate was as follows :—

Period (months)	*Died*	*Recurren Disease*	*Total*
0–6	25+2	13	40
6–12	33	12	45
12–18	22	10	32
18–24	11	7	18
24–30	18	1	19
30–36	8	1	9
36–42	2	1	3
42–48	3	0	3
48–60	3	1	4
60–72	1	0	1

Dead.—Of the dead, 98 patients were treated over 5 years ago, 4 lived up to the 5-year period, and 1 survived it. This patient developed a recurrence locally inside the treated area. Three years after treatment an abdomino-perineal resection was done, but she died from metastases 3½ years later. Presumably, then, she was never cured.

Four patients died within two years from undoubted other causes and with controlled carcinoma of the rectum, completely symptom-free. Two of these were over 80 years of age and survived three and two years without colostomy, and they died from auricular fibrillation and heart failure.

It is very difficult to describe the value of relief from symptoms due to the primary growth. In 42 patients there was marked regression or complete disappearance of the primary growth. A general practitioner returned to a full practice and died from metastases ; a second was well for three years, then developing metastases. One patient, with metastases in the liver when he was treated, lived a comparatively normal life for fifteen months ; the primary growth disappeared and he had no rectal symptoms. In 52 patients out of the 118 inoperable patients, the notes read " relief of pain, no discharge per rectum, no symptoms due to primary growth ". In 2 cases a neoplastic rectovaginal fistula healed and incontinence was relieved, one living comfortably for thirty months.

The worst cases of necrosis in the series were in patients who received further treatment. One went to another hospital two years later with recurrent disease. He received further X-ray therapy and developed a severe necrosis of perineum, sacrum, coccyx, and bladder. Another had intrarectal radium in a Stebbing's applicator and most of his pelvic tissues sloughed away. A third had an abdominal

excision of the bowel one year after therapy for a carcinoma at the pelvirectal junction. The wound never healed—she developed a coccygeal necrosis and died from infection. She had had slight bleeding per rectum prior to operation and sigmoidoscopy had revealed a small ulcer at the primary site. The tragedy of this case lies in the fact that after removal the ulcer did not show any growth—it was a small area of necrosis and there were no metastases.

Recurrent Disease.—Fifty-two patients with recurrent carcinoma of the rectum following surgical treatment were treated, 23 following perineal excision, the average interval since operation being 22 months, the longest 48 months, and the shortest 6 months. Eighteen were after perineo-abdominal excision, the times being 25 months, 72 months, and 3 months. Twenty-five died within 12 months, whilst 41 were dead within 2 years; 1 lived 3 years, 1 4 years, and 1 5 years, and then died; 8 are alive and well, 2½ years (2), 3½ years (3), 5 years (2), and 8 years (1) after treatment. In 2 of these a papilloma was removed, found to be malignant, and recurred. One is alive 8 years and 1 5 years after treatment, although one of them has a slight stricture at the site of the lesion.

Response to the treatment varied; in some, vaginal, perineal, and even skin nodules disappeared, as did local recurrent masses, but ill patients with large metastases, with infected perineal sinuses, and with urinary infection derived little benefit. As Phillips pointed out, some surprising results were obtained. A man aged 35 had a recurrence in the stump of a Hartmann's operation, but lived for 4 years, for 3½ of which he was back at work. A blacksmith, aged 55, with a perineal recurrence and inguinal glandular metastases returned to full work symptom-free for 2 years, and died in the third year. A soldier had an abdomino-perineal excision in Cairo and 1 year later he had fungating growth around his colostomy. He remains alive, well, and at full work 5 years after treatment.

Carcinoma of the Anal Canal (Squamous-cell Carcinoma).—In the period up to 1945, 25 patients have been treated.

Stages	*Patients*	*Alive*
Local disease	3	1 33 per cent
Local disease with operable local metastases	8	3 25 per cent
Inoperable primary and/or fixed glandular metastases	12	4 33 per cent

The general condition in 12 of these 23 patients was poor—they were old and feeble—the youngest being 35 years and the oldest 83. The average age was 62 years. The average delay before treatment was 6 months. Eight patients are alive and 15 are dead. Of those alive, 1 has survived 2 years, 4 for 3 years, 2 for 5 years, and 1 for 6 years.

Eleven patients have been treated over 5 years and of these 3 are alive and well. Three of the 8 survivors had inoperable lymph-node metastases in the groin, 1 patient had a large necrosis, another a small symptomless necrosis, whilst 2 have anal strictures, in both precluding the closure of a colostomy. One developed a local recurrence for which a perineo-abdominal excision has been done.

Dead.—15 patients are dead, all having died of their disease. In 7 of these the primary growth regressed completely and they died from metastases. In the others there was marked regression of the primary growth and lymph-node metastases. One died 5½ years after treatment from a cerebral haemorrhage without recurrence of his primary growth.

Dead—1st year	10	
2nd year	2	
3rd year	1	
4th year	1	
5th year	1	other causes

As is indicated by the number of deaths in the first year, some were very advanced. They had either growth involving the perineum or fixed inguinal metastases. In the majority, symptoms were relieved, with comfort and freedom from pain and discharge. In one case, recurrence occurred within the treated area. This patient was further treated by means of radium and he developed anal and perineal necrosis. Five patients out of the 23 had serious radiation necrosis, in only 1 of whom healing occured. Necrosis was probably responsible for death in one patient.

One may therefore summarize by saying that supervoltage therapy is a distinct advance over ordinary deep X-ray therapy in the treatment of carcinoma of the anus. Regression of the primary growth occurs and symptoms are relieved. The dangers of necrosis are high and the treatment in advanced cases should be less severe when the objective is palliation. It can never be repeated, neither should radium be used unless the dose is adjusted. One should realize one's limitations and appreciate that the very advanced case is beyond the scope of any form of therapy.

CONCLUSIONS

1. Operable carcinoma of the rectum is a disease for which surgery holds complete priority. Even in advanced disease with metastases, removal of a resectable rectum can relieve a patient of distressing symptoms due to the primary growth.

2. Radiotherapy plays a definite role in the treatment and management of carcinoma of the rectum. Deep X-ray therapy is not of much value; a penetrating beam is essential. With this it is possible to obtain complete resolution of the primary growth, with consequent relief of symptoms due to the primary tumour. In our series this relief was obtained completely in 42 per cent and appreciably in 60 per cent. In some cases this can be long-lasting and can be attained without injury to the patient, and a colostomy may be avoided. The treatment itself is trying for the patient and has to be planned and executed with meticulous care. Regression of the primary tumour is more certainly obtained in squamous-celled carcinoma of the anal canal than in adenocarcinoma of the rectum. In both sites, excellent palliation and prolongation of comfortable life, not merely existence, can be expected in patients with advanced disease, provided that disease is still confined to the pelvis. Pain and tenesmus are relieved, bleeding and discharge are arrested, and ulceration heals. Toxic absorption is decreased, and the general well-being of the patient is improved.

Although the figures for long-term survival are small, they show a definite improvement on those for alternative forms of radiotherapy. Some selection of patients is essential; we should appreciate our limitations and confine treatment to cases in which there is reasonable prospect of producing regression of the tumour mass with relief of symptoms. For patients with advanced disease and infection, colostomy alone is much less trying for the patient and results may be achieved more quickly for the remainder of the patient's life. The question of radiotherapy here needs careful consideration, for colostomy may reduce available ports of entry and so make adequate radiotherapy difficult. To attempt the hopeless is worse than useless, and the only indication for radiotherapy in very advanced disease is to try and relieve pain due to invasion of, or pressure on, the pelvic nerves.

3. Treatment should be considered whenever the surgeon and pathologist report that the disease has extended beyond the rectal wall. Untreated, 50 per cent of these patients will develop recurrences and metastases from which they will die. Radiotherapy is not advised as a routine pre-operative measure. Profound changes occur in the pelvic tissues following this heavy irradiation and the risks of necrosis are high.

4. We do not consider that the improvement in the effects of these radiations is due to the shorter wave-length of the million-volt X rays. It is not a difference in biological effect, but is due rather to the increased depth-dose and to the greater accuracy, efficiency, and ease of application.

I wish to thank the members of the Staff of St. Bartholomew's and St. Mark's Hospitals for their assistance, and especially to record my appreciation of the work commenced and carried out by Mr. Ralph Phillips and Mr. George Innes with this high voltage unit.

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THE SURGICO-PATHOLOGICAL ASPECTS OF MYASTHENIA GRAVIS

BY HUGH REID, LIVERPOOL

LESS than three years ago an article appeared in the BRITISH JOURNAL OF SURGERY on the surgery of the thymus gland by Geoffrey Keynes (1946), in which he stated: "In the whole range of the BRITISH JOURNAL OF SURGERY, from its beginning in 1913 to the present time, not a single contribution has been made on the surgery of the thymus, although this journal covers the most progressive period in the long history of surgical science."

This does not mean, however, that in other countries, notably in Germany and in America, surgical attacks on the thymus have been neglected, or that in England research on the disease known as myasthenia gravis has not been carried out.

It is well known that Wilks first distinguished myasthenia gravis from bulbar palsy as early as 1877, and that in 1901 Weigert first called attention to a persistent thymus with lymphocytic infiltration into the muscles as bearing some relationship to this curious disease. Weigert further described a case of myasthenia gravis with lymphosarcoma of the thymus found at autopsy.

In 1911 Sauerbruch made the first recorded attempt at surgical removal of the thymus as a therapeutic measure.

This was in a girl of 21 years who was also suffering from Basedow's disease, and Sauerbruch extracted the thymus through a transverse incision in the neck. Two years later, when reported on by Schumacher and Roth (1913), the patient was much improved, but they considered the time too short to speak of cure. Von Haberer (1918) reported a case of myasthenia gravis with the thymus in a state of involution, which he removed in part through the neck. In 1937 Sauerbruch again attempted to relieve the condition by operation and found tumours of the thymus in 2 cases. At about the same time Blalock was working on this problem and reported 6 cases of myasthenia gravis in which he removed a persistent thymus by a wide exploration of the mediastinum (Blalock, Mason, Morgan, and Riven, 1939). Two years later Blalock reported 20 cases of thymectomy with encouraging results, and this laid the foundation of the modern surgical approach to this disease (Blalock, Harvey, Ford, and Lilienthal, 1941).

My own experience consists of 6 cases of myasthenia gravis in which I removed the thymus or a tumour at operation. Four of them were associated with a so-called 'persistent' thymus, one had a malignant thymoma, and one an innocent thymoma.

CASE REPORTS

Case 1.—A woman (H. A.), aged 28 when first reporting in March, 1945, complained that three months after the birth of her only child in June, 1944, she noticed weakness in both arms and legs. Within a fortnight she had noted progressive weakness of her voice towards the end of the day; more recently, she had some dysphagia and complained of weakness of the

muscles of mastication and sagging of the lower jaw after a meal. In February, 1945, she noted difficulty in knitting, curling her hair, and in external rotation of her right eye, so that she had occasional attacks of blurring of vision with diplopia.

On Examination.—The relevant abnormal physical signs were bilateral ptosis, an inability to close the eyes tightly, and marked dysarthria, the patient being able to hold a conversation for only three minutes, becoming then virtually anarthric. She showed ready fatigability of all limbs, the tendon and abdominal reflexes being exaggerated, but tiring rapidly on repeated elicitation. The pupillary responses to light and to accommodation were sluggish and soon disappeared on repeated stimulation.

The patient's signs and symptoms were found to respond dramatically to prostigmin, but it was found that the dose had to be increased over the next two months, so that by the beginning of May she required six 15-mg. tablets by mouth and five injections of 0·5 mg. to maintain comfort.

At Operation (May 6).—A thymus gland weighing 11·3 g. was removed from the anterior mediastinum after the sternum had been divided with a pneumatic saw.

The post-operative period was uneventful and on the third day prostigmin was discontinued, as no signs or symptoms of myasthenia were evident. Seven days later the house physician reported having held a conversation with the patient lasting 45 minutes.

Pathological Report.—The thymus gland shows a moderate degree of age involution. The cortex of the gland is well demarcated from the medulla. In the

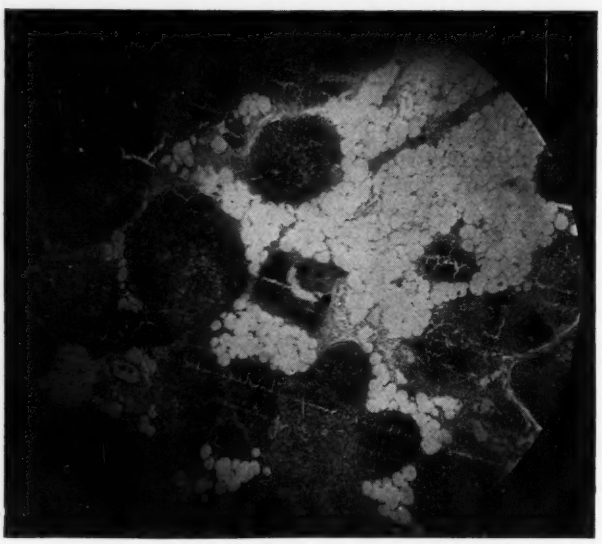

Fig. 515.—*Case* 1. Section showing numerous areas of varying size characterized by proliferating reticulum cells arranged in a focal manner and showing actively dividing cells with numerous mitotic figures. These areas are surrounded by a dense rim of lymphocytes. Hassall's corpuscles are prominent, but undergoing hyaline degeneration in some areas. (× 150.)

medulla and cortex there are numerous areas of varying size characterized by proliferating reticulum cells arranged in a focal manner and showing actively dividing cells with numerous mitotic figures. These areas are surrounded by a dense rim of lymphocytes. The medulla also contains an increased number of lymphocytes, which are scattered uniformly throughout this portion of the gland. Hassall's corpuscles are prominent, but are undergoing hyaline degeneration in some areas (*Fig.* 515).

Subsequent Progress.—The patient reported for review in August, 1948. Her only complaint was occasional difficulty in focusing the eyes, especially when at the cinema.

On examination, a little weakness in the external rectus muscle of the right eye could be demonstrated. There was no weakness in the arms or legs and she said she could walk or cycle without difficulty.

She is doing full household work and rises at 6.30 a.m. and retires at 11.0 p.m. without taking any rest in the daytime. Her boy is now 4½ years old.

She has not taken any prostigmin since the third day after her operation.

Case 2.—A man (A. B.), aged 29, reported in February, 1945, that in November, 1944, he had had a sudden onset of weakness of the body and difficulty with speech. This condition had become much worse over the three-months period.

He was found to show bilateral ptosis, dysarthria, and dysphonia. The limb muscles could be readily fatigued, and the pupillary and tendon reflexes appeared sluggish on initial elicitation, disappearing on repetition. It was noted that his weakness became more marked as the day progressed, and he showed the interesting effect of a deterioration of the general signs and symptoms on exercise of one limb, this also occurring a few minutes after release of the pressure when the exercise had been performed with a sphygmomanometer cuff inflated to 70 mm. Hg around the proximal part of the limb. The electrical reactions of the forearm muscles showed the so-called ' myasthenic reaction '.

The patient was given prostigmin by mouth with great relief, and was discharged home on four tablets of 15 mg. of the drug daily.

His condition soon deteriorated, however, and he was re-admitted in August, 1945, when he was found to require eight tablets and three 0·5-mg. injections of prostigmin daily, though confined to bed.

A chest radiograph taken at this time showed a large mass lying on the pulmonary conus and left auricle.

At Operation (Sept. 16).—A large thymoma was removed from the anterior mediastinum. The growth was overlying the pericardium and adherent to the left pleura and to the great blood-vessels of the mediastinum. In addition, a normal thymus was removed.

He was very well after the operation, but on the evening of the second day he collapsed, becoming very dyspnœic and showing extreme weakness, and died within an hour despite very large doses of prostigmin and a blood transfusion.

At Autopsy.—The left pleura contained approximately 1100 ml. blood, the heart was of normal size but tightly contracted, and the pericardium showed petechiæ posteriorly. The left lung was totally collapsed, the bronchi being patent, and the right lung was very œdematous, sufficiently so to sink in water, the bronchi being patent. The anterior mediastinum showed no apparent source of the hæmorrhage. There was no other abnormality detected.

It was considered that the patient had a secondary hæmorrhage into the left pleural space which precipitated a myasthenic crisis from which he died.

Pathological Report.—

1. *Growth overlying Heart.*—This is a diffuse large reticulum-cell thymic carcinoma. Intermingled in a fairly uniform manner among the reticulum cells are well-formed lymphocytes giving the general impression of a ' lympho-epithelioma '.

2. *Thymus Gland.*—This shows almost a normal degree of age involution, with the lobules separated by large amounts of fatty tissue. The differentiation of cortex and medulla remains distinct. In the medulla small circumscribed follicles composed of reticulum cells are present. Hassall's corpuscles are well defined, some of which show early degenerative changes. There is no evidence of malignancy in this tissue.

Case 3.—A girl (D. J.), aged 16, reported in October, 1945, that she had had a feeling of weakness in her legs and arms since June, 1944. She had first noted dysarthria some six months later, and this symptom was soon accompanied by dysphonia and dysphagia.

ON EXAMINATION.—She was found to show a rather expressionless face with bilateral ptosis and a tendency to sagging of the mouth. There were no abnormal physical signs other than ready fatigability of the muscles and of the tendon reflexes.

She had been relieved by prostigmin since March, but for the past three months had been in another hospital, as she was subject to attacks of dyspnœa at rest. Some of these were observed, the patient becoming progressively more breathless and the respirations shallower until she collapsed, almost apnœic and generally flaccid. Artificial respiration had to be performed until prostigmin by injection had produced restitution to normal.

In October her general symptoms were controlled by ten tablets of 15 mg. prostigmin daily with two injections of 0·5 mg. before the main meals.

AT OPERATION (Oct. 17).—An irregular lobulated thymic gland weighing 22·5 g. was removed from the anterior mediastinum.

The post-operative period was uneventful, the patient being discharged thirty days later taking only three 15-mg. tablets of prostigmin daily. After two months the prostigmin was entirely stopped, as she felt perfectly fit.

PATHOLOGICAL REPORT.—This gland shows delayed age involution. Cortex and medulla are not so well demarcated. The medulla contains numerous follicular structures of large size composed of actively dividing reticulum cells and surrounded by a rim of lymphocytes. Hassall's corpuscles are present in large numbers. In some of the cortical areas there is a dense fibrocytic reaction which extends in some places as far as the medullary portion of the gland and appears to be strangulating, in some instances the Hassall's corpuscles (*Fig.* 516).

FIG. 516.—*Case* 3. This gland shows delayed age involution. Cortex and medulla are not so well demarcated. The medulla contains numerous follicular structures of large size composed of actively dividing reticulum cells and surrounded by a rim of lymphocytes. Hassall's corpuscles are present in large numbers.

In some of the cortical areas there is a dense fibrocytic reaction which extends in some places as far as the medullary portion of the gland and appears to be strangulating, in some instances, the Hassall's corpuscles. (× 150.)

SUBSEQUENT PROGRESS.—The patient reported for review in August, 1948. For the past two years she has been doing full work from 8.30 a.m. until 5.0 p.m. as a clerk. She goes to dances and to the cinema and often stays up until midnight. Occasionally her fingers or her legs feel a little tired and she takes a tablet of prostigmin, perhaps once in three months.

There is no dysphagia and she can talk indefinitely without difficulty. No signs or symptoms or myasthenia could be demonstrated.

Case 4.—A girl (M. T.), was first seen in November, 1945, when she complained that nine months before, whilst in the Women's Land Army, she began to feel tired all over and noticed that her eyelids were drooping.

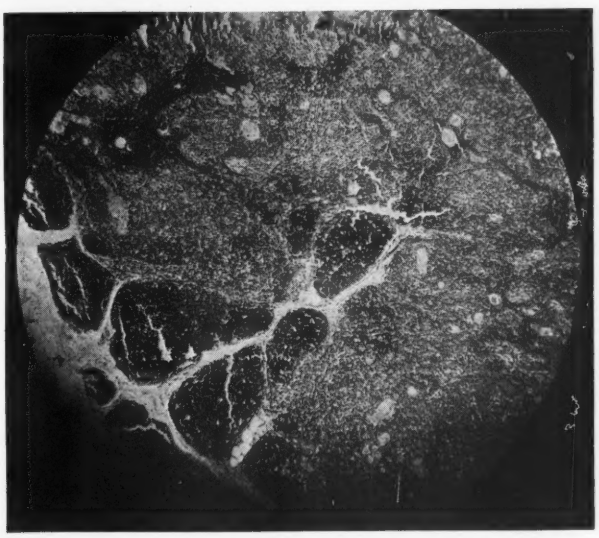

FIG. 517.—*Case* 4. Shows hardly any age involution. In the medulla is an infiltration of lymphocytes condensed into circular zones surrounding actively proliferating reticulum cells. Hassall's corpuscles are present and the cortical area is well demarcated. (× 150.)

In the cold her mouth felt stiff, but became normal on returning to a warm atmosphere. She left the Land Army and remained at home, but two months later began to see double, her jaw muscles began to tire during a meal, and she would be forced to discontinue eating the meal. Sometimes the jaw would become so weak that she would have to hold up her chin with her hand to prevent the mouth hanging open. The feeling of heaviness of the lids interfered with visits to the cinema because she would have to hold her head farther and farther back in order to see the screen. The knees and legs would feel very tired when dancing and when going up steps. She always noticed that the symptoms were worsened in bright light.

ON EXAMINATION.—Examination revealed a bilateral ptosis, the pupils seemed rather dilated, and the reactions to light accommodation were normal. The muscles were readily fatigued, as were the tendon reflexes, which were brisk on first testing.

It was demonstrated in this patient that voluntary power remained in a muscle after it had been fully fatigued by faradization with a tetanizing current, and vice versa.

Prostigmin 0·5 mg. intramuscularly once daily and 15 mg. orally four times a day was found necessary to control the symptoms.

AT OPERATION (Nov. 28).—A lobulated mass of thymic tissue weighing 13·5 g. was removed.

After an uneventful convalescence the patient was discharged taking two tablets of prostigmin daily. This was later discontinued and the patient remained free from symptoms for two years. She reported in November, 1947, with a few weeks' history of dysphagia

and dysarthria and ptosis, and had to be put on prostigmin again.

PATHOLOGICAL REPORT.—This shows hardly any age involution. In the medulla is an infiltration of lymphocytes condensed into circular zones surrounding actively proliferating reticulum cells. Hassall's corpuscles are present and the cortical area is well demarcated (*Fig.* 517).

SUBSEQUENT PROGRESS.—The patient reported for review in August, 1948. For the past two and a half years she had been working as a cashier in a cinema from 1.30 p.m. to 9.0 p.m. She gets up at 9.0 a.m. to do housework and again continues her housework after her work at the cinema until 11.0 p.m.

Since October, 1948, her general condition has deteriorated and she requires five 15-mg. tablets of prostigmin to keep her going. The effect of the prostigmin lasts for 2–3 hours and after this time she becomes weak and tired, has dysarthria and dysphagia, her eyelids droop, and she feels like a clockwork doll which requires winding up.

Case. 5.—A woman (M. S.), aged 31, reported on April 11, 1947, complaining that she had had increasing difficulty in swallowing, weakness of the limbs, and falling of the upper lids for twelve months.

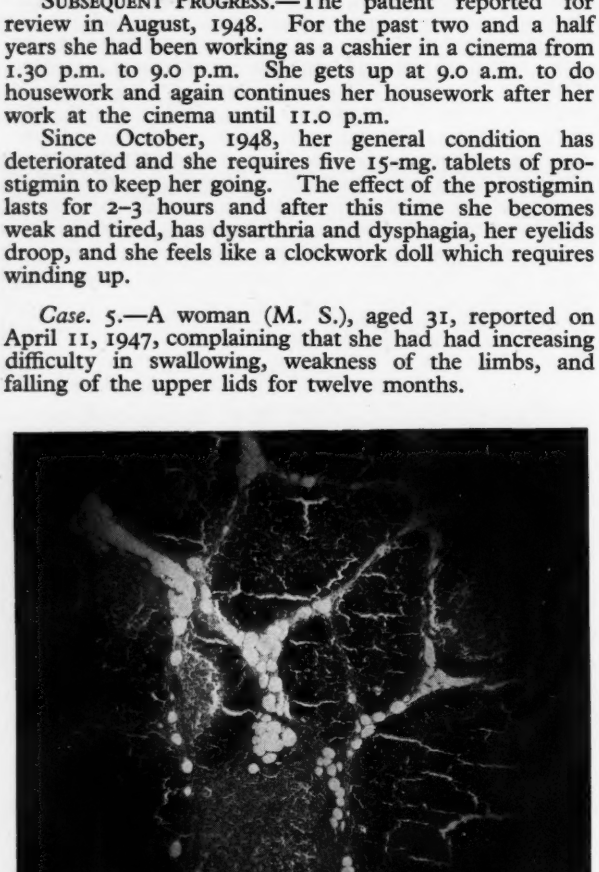

FIG. 518.—*Case* 5. Shows delay of age involution. A well-demarcated cortex and areas of actively dividing cells arranged in a follicular manner. (× 150.)

In January she had noticed that she occasionally saw double, especially on looking to the side; in March drooping of the lower lip appeared, and for the previous week, dyspnœa on exertion.

ON EXAMINATION.—She was found to have ptosis, a typical myasthenic snarl on attempting to smile, and ready fatigability of the arms, and she moved the jaw manually when chewing. The reflexes were brisk but readily tired, and all symptoms and signs were noted to become worse on exposure to direct sunlight.

She obtained definite relief on ten tablets of prostigmin daily with an injection of 0·5 mg. before her main meals.

AT OPERATION (April 30).—An enlarged lobulated thymus gland weighing 13·5 g. was removed. The convalescence was interrupted by the presence of a small hæmothorax, which was aspirated on April 6, and she was discharged a fortnight later taking a tablet of prostigmin twice daily.

When seen in January, 1948, she had gained over 2 st. in weight and appeared to be very well indeed, her features being quite normal, but she was taking two tablets of prostigmin daily.

PATHOLOGICAL REPORT.—This gland shows delay of age involution. The cortex is well demarcated and there are areas of actively dividing cells arranged in a follicular manner (*Fig.* 518).

SUBSEQUENT PROGRESS.—This patient reported for review in August, 1948. She said that she felt well and was able to do full household work without feeling tired. She is gradually putting on weight and takes two tablets of prostigmin each day.

Case 6.—A man (J. S.), aged 53, first noticed loss of voice in 1940 (he was a bass singer). Soon afterwards his voice became nasal after speaking. Dysphagia and diplopia then developed and he gradually lost power in his skeletal muscles and became bed-ridden. He was fed rectally and given prostigmin.

There was gradual improvement over a month, so that he was able to return to work as a clerk.

He relapsed in 1943, but by increasing the prostigmin to four 30-mg. tablets daily he was able to return to work again.

In May, 1948, he became weaker, in spite of increasing doses of prostigmin, and was admitted to hospital, where he was given two 30-mg. tablets of prostigmin every two hours.

Radiographs of the chest showed no evidence of pulmonary pathology.

AT OPERATION (June 9).—The mediastinum was explored after dividing the sternum in the midline with a pneumatic circular saw. A hard, rounded, lobulated tumour, the size of a hen's egg, was discovered lying over the root of the aorta. The tumour was seen to be infiltrating the right pleura and the adjacent portion of the lung, so that the right pleura had to be opened before the tumour could be freed and delivered.

The condition of the patient throughout the operation was satisfactory and he made a good recovery.

PATHOLOGICAL REPORT.—The tissue consists of large masses of lymphoid without any trace of Hassall's corpuscles or lymphoid follicles; the masses are separated by rather dense fibrous tissue. The lymphocytes, which form practically all the tissue, show no mitoses. The reticulum cells are, however, prominent and in many areas form packed groups. There is no question at all that these are reticulum cells; they are certainly not epithelial cells.

SUBSEQUENT PROGRESS.—The patient reported for review in August, 1948. He said that he could talk and eat without difficulty, but there was a slight weakness in the hands. He is taking 30 mg. of prostigmin by mouth three times a day and 2·5 mg. at night intramuscularly. He works in his garden and visits the cinema, but has not returned to his occupation as a clerk.

AETIOLOGY

A considerable amount of research has been carried out in attempts to show the relationship of the 'persistent' thymus, and of tumours of the thymus, to myasthenia gravis.

The clinical manifestations of myasthenia gravis are often so localized and so ephemeral as to throw doubt on its having any simple aetiological explanation, and our present knowledge of thymic physiology throws little light on the function of the thymus as a ductless gland.

The effect of injecting thymic extract into dogs to support the hypothesis that an internal secretion exists was carried out by Bory (1923), and the injection of an extract of thymus from a myasthenic patient was recorded by Adler (1937) as reproducing some of the symptoms of myasthenia in the dogs which he injected. More recent work has been directed to the changes which may take place in the

normal discharge between motor nerve-endings and muscle-fibres.

Normally the production of acetylcholine is held to activate muscle and this is balanced by the enzyme cholinesterase. In myasthenia gravis, it may be that insufficient acetylcholine is produced, that excessive cholinesterase activity is present, or that some curare-like substance interferes with the balance.

Since the work of Reman in 1932, prostigmin has been known to relieve the condition, and with the various possibilities in mind, workers such as Cooke and Passmore (1936) and Wilson and Stoner (1944, 1947) have examined the effect of different drugs on the myasthenic patient, and concluded that there was evidence of a circulating inhibitor responsible for the primary neuromuscular defect, which might arise in the thymus.

Two new substances have been described as influencing the neuromuscular transmission, namely di-isopropyl-fluore-phosphonate, which Grob and others (1947) found to depress cholinesterase activity in both plasma and red blood-corpuscles, and amigen, which Torda and Wolff (1947) claim to act by increasing the synthesis of acetylcholine.

From the pathological side, Willis in 1948 points out that although there is no clear evidence that the thymus produces an internal secretion, certain observations suggest some relationship of thymic and endocrine function. Thyrotoxicosis is often accompanied by thymic enlargement, as it was in Sauerbruch's classical case, and cases of thymic tumour or enlargement have shown marked endocrine disturbances.

Willis cites Leyton and others, who described the necropsy findings in two patients with thymic tumours, one a boy of 11 years who had hirsutism and diabetes, the other a man of 31 years with adiposity and diabetes; both cases showed also enlargement of the thyroid and adrenal cortex. Duguid and Kennedy saw a thymic tumour accompanied by a similar endocrine disturbance in a woman of 64. Parkes Weber described a case of precocious muscular and sexual development in a boy who had also an extensive unilateral pigmented nævus and X-ray evidence of marked thymic enlargement; later, however, this boy developed normally, and the enlarged thymic shadow in the radiograph disappeared (Willis, 1948).

PATHOLOGICAL DISCUSSION

Discussion has arisen regarding the meaning of the term 'persistent' thymus, and the origin and role played by the different constituents of the gland.

Norris (1938) states that the thymus is derived from the third branchial complex, that is, from an ectodermal pouch, and the corresponding ectodermal sinus.

The epithelium of the ectodermal pouch gives rise to the syncytial cytoreticulum of the gland and the sinus to the primitive thymic cortex and to Hassall's corpuscles. The bulk of the gland consists of thymic lymphocytes, which he considers arise from the mesenchyme and secondarily invade the gland. The fibrous reticulum or framework, Norris says, is derived from the adventitia of the blood-vessels.

It is well recognized that in the infant the thymus is a lobulated structure sharply divided into a cortex, consisting of closely packed masses of lymphocytes, and a medulla made up of a loose connective-tissue framework in which epithelial cells are found with indistinct cell outlines.

Hassall's corpuscles can be recognized as concentric masses scattered irregularly throughout the medulla.

At puberty, the amount of thymic tissue present in each lobule begins to decrease and the lobules thereafter become separated by increasing quantities of fatty tissue. The cells first to disappear are the lymphocytes; later, there is a decrease in the number of epithelial cells, but the differentiation of cortex and medulla remains distinct.

In the 4 cases of myasthenia gravis in which I have removed a persistent thymus at operation and submitted it for pathological investigation to Dr. Winston Evans, evidence of age involution could be found in each instance, varying from a moderate to a slight degree. The medullary portion, however, was infiltrated in irregular pattern by lymphocytes to a far greater degree than normal.

The presence of reticulum cells showing active mitotic division (*Fig.* 519) was also a constant and characteristic feature of the medullary portion. These were arranged in a focal and circumscribed manner and were surrounded by a ring of lymphocytes (*Fig.* 520). These follicle-like structures resembled Flemming centres seen in reactive non-specific follicular hyperplasia of lymph-glands and of intestinal lymphoid tissue.

Cowdry (1938) states that lymphoid follicles with germinal centres are not found in the normal human thymus, although these structures have been described by Jolly and Tannenberg (1931) in the thymus of the cat. They have also been described by Miller (1940) and Barton and Branch (1937) in the thymus associated with hyperthyroidism and myasthenia gravis.

Winston Evans (1948) examined in detail 9 specimens of thymus gland obtained at post-mortem from patients of varying ages who had died from diseases other than myasthenia gravis or affections of the thyroid and found no evidence of germinal follicles.

Bratton (1948) gave the findings in 70 thymuses removed at operation for myasthenia gravis. Comparisons with controls of similar age-groups showed that the weight and shape of the gland were the same and did not support the theory of persistence of the gland in myasthenia gravis. There was, however, a quantitative difference in that the myasthenic thymuses showed denser concentrations of lymphocytes in the islets with a small number of lymphocytes in the medulla, and a structure resembling a germinal centre in the cortical nodules. These were present in 66 of the myasthenic glands and in only 3 of the non-myasthenic control glands, suggesting that the thymus was reacting like lymphoid tissue rather than like epithelial tissue.

It appears, then, that in this present series of cases, although the delay of involution, the excessive lymphocytic infiltration of the medulla, and the follicular hyperplasia were constant features, no direct significance could be attributed to them in the pathogenesis of myasthenia gravis.

The pathology of the two tumours of the thymus removed at operation, together with four other tumours which were observed but not removed, has been discussed in a previous communication (Reid and Marcus, 1948).

SUMMARY

The pathological aspects of myasthenia gravis are discussed, together with a summary of the aetiology of this condition.

Six personal cases which were operated upon are given in detail.

Four cases of so-called ' persistent ' thymus were encountered with severe symptoms of myasthenia gravis. After an interval of three years after operation, three of these cases are back at full work with little or no symptoms. One has relapsed and requires regular doses of prostigmin.

One case had a large malignant thymoma with severe myasthenia gravis and died post-operatively.

One case had a benign thymoma with severe myasthenia gravis. After an interval of three months after operation, he is much improved but has not yet returned to work.

Acknowledgements.—It is a great pleasure to acknowledge the help of my colleagues.

I am especially indebted to Dr. H. S. Pemberton, of the David Lewis Northern Hospital, for his advice on the preparation of this paper. Dr. Pemberton referred the first five cases to me and is responsible for their assessment and suitability for operation.

To Dr. Winston Evans I am grateful for invaluable discussions on the histopathology and for the preparation of the specimens and the microphotographs.

My thanks are also due to Dr. R. D. Hotston, of the David Lewis Northern Hospital, for his care in the immediate pre- and post-operative period at the David Lewis Northern Hospital and for his subsequent follow-up of patients.

The sixth case was referred to me by my colleague, Dr. Wyn Jones, at the Royal Infirmary.

The anæsthetic is of vital importance in an operation which may involve the opening of both pleural cavities; Dr. T. Cecil Gray has ensured perfect conditions.

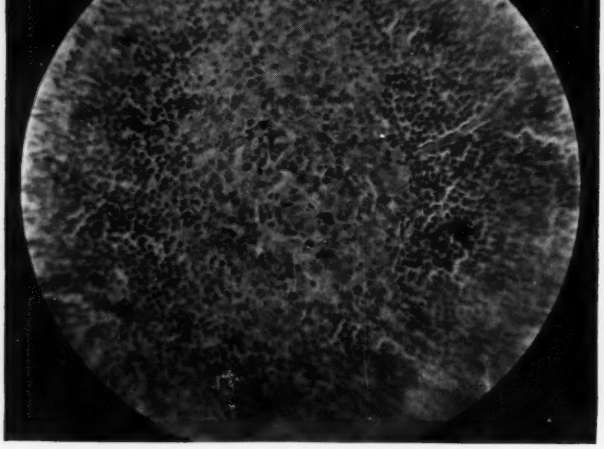

FIG. 519.—Follicle showing actively dividing cells. (× 350.)

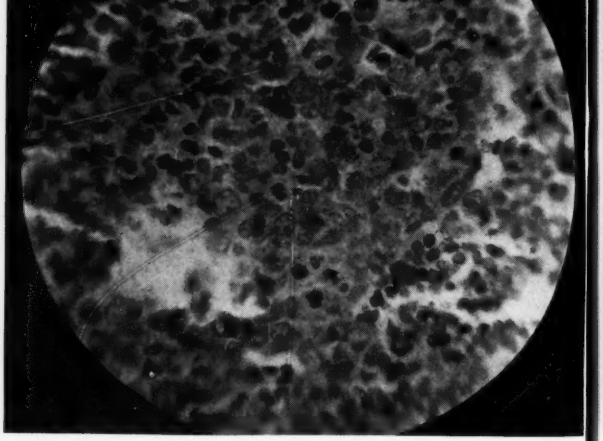

FIG. 520.—Detail of *Fig.* 519. (× 1000.)

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POST-OPERATIVE BILIARY FISTULA

DESCRIPTION OF A NEW RECONSTRUCTIVE OPERATION

By STANLEY O. AYLETT, M.B.E.

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BILIARY fistulæ following upon operative procedures on the gall-bladder and bile-ducts are fortunately rare, but probably by no means as uncommon as the comparatively few recorded cases of successful repair would lead us to believe. This complication of a straightforward operation is customarily regarded as a surgical stigma and the many failures of attempted reconstructive surgery are unlikely to find their way into an oftentimes too critical world. Success is blazoned abroad, but failure lies buried beneath a tombstone, or at best hidden by a rubber bag, each day collecting the seven hundred odd cubic centimetres of bile that drip into it from the patient's fistula.

Prof. Grey Turner (1934), with a lifetime of unrivalled experience upon which to draw, states, in discussing the subject of reconstructive operations for biliary fistulæ: "The surgical procedures are very serious undertakings and the mortality following them is necessarily high and is not always truly represented by the published cases."

If therefore an operation can be devised which, whilst establishing continuity of the flow of bile, reduced to a minimum the operative hazards and mortality of extensive and prolonged reconstructive procedures, some service may be done to the unhappy patient and his still more unhappy surgeon.

It is the main purpose of this paper to describe such an operation carried out with apparent unqualified success on one patient. One successful operation does not make a successful routine procedure any more than one swallow makes a summer, but even from the world's largest clinics the number of reported cases is not large. It is hoped, therefore, that the procedure to be described may be followed by the other surgeons faced with such a problem so that the merits or otherwise of this operation may be determined by a series of cases of reasonable number.

Warren Cole (1946), reporting from the Illinois Research Hospital, states that in 76 per cent of cases of biliary fistulæ operative trauma was the factor responsible for the production of the fistula, and it is only by meticulous isolation of the tripartite junction of cystic duct, common bile-duct, and common hepatic duct, and the careful dissection of the cystic artery, before any clamp or ligature is applied, that the high percentage can be reduced. Anatomists and surgeons have helped in drawing our attention to the many variations of the normal that exist in this all-important region.

Of the remaining 24 per cent the causation is somewhat obscure. In certain cases unexplained infection and abscess formation about the region of the operation can give rise to destruction of the common bile-duct, so that it becomes completely fibrosed and is recognizable only as a thickened fibrous cord. Hicken, White, and Coray (1942) have shown by cholangiographic studies that associated chronic pancreatitis, when present in the head of that organ, may be responsible for obstruction and biliary fistula formation. They have also demonstrated by like methods that the condition may subside sufficiently during the post-operative period to allow the natural drainage of the bile to become re-established so that the fistula slowly closes. It was, no doubt, because of this slow natural closure in a proportion of cases, that Sir David Wilkie is quoted by Aird (1948) as having said that the ultimate criterion of high aptitude for a surgical career was not dexterity of hand or brilliance of intellect, but the ability to see weekly for six months a patient with a biliary fistula and never mention the word bile.

Obstruction due to a gall-stone impacted in the region of the ampulla of Vater and overlooked at operation, may also give rise to a persistent fistula. The obstructive element may be recognized in the post-operative period by cholangiographs, the crescentic edges to the shadow at the lower part of the common bile-duct, as the dye is obstructed by the curved stone, being characteristic. But by thorough exploration of the common bile-duct at operation both by external digital exploration and by the passage of a soft catheter down into the duodenum through the common bile-duct such residual obstruction can be avoided.

In rare cases a fistula may result from coexistent carcinoma in the region of the ampulla of Vater, which, during the removal of the gall-bladder and perhaps drainage of the common bile-duct for associated calculi in the hepatic ducts, is overlooked at the time of operation. Impaction of a calculus at the lower end of the common bile-duct producing ulceration, with resulting stricture, may also provide the obstructing element productive of a post-operative fistula. Finally, fistulæ may follow upon traumatic injury to the biliary apparatus, as in gun-shot wounds of the abdomen.

According to Balfour and Ross (1921) persistent drainage of biliary fluid for three weeks after the removal of a drainage tube is indicative of obstruction to the flow of bile into the abdomen. It is at the end of this period that the existence of an obstructive element becomes a certainty, and it is then that action has to be decided upon in an endeavour to re-establish the normal bile route. Undoubtedly these cases should be observed for many weeks. The possible existence of a chronic pancreatitis as a cause of the obstruction can at least sustain the hopes of the surgeon that the fistula may heal. Cholangiographs can be carried out in an effort to find the site and cause of obstruction, and if an overlooked calculus is shown to exist there is always the possibility that this may disimpact or pass on into the duodenum. Best and Hicken (1938)

have reported cases in which the stone has been disimpacted and has been washed into the intestine by injection through the fistula with warm olive-oil, but most will need re-exploration to remove the residual stone.

With replacement oral therapy by bile-salt preparations patients with a biliary fistula may live in reasonable health for many years. I know of one case in which, in spite of numerous attempts at repair, the fistula has persisted for over five years. But eventually the distaste and inconvenience of a receiving bag will drive the patient to plead that some repair be attempted.

Reference to the literature provides a wide choice of operative procedure. Horgan (1932) in his monograph provides a valuable review of most types of operations and anastomoses that have been performed. Lahey (1937), in discussing strictures of the common and hepatic duct, emphasizes his preference for reconstruction of the duct system, and Walton (1915) describes his operation of refashioning of the common bile-duct from duodenal mucosa. As a method of choice anastomoses have been fashioned about rubber tubes (Couch, 1936; Montgomery, 1947), whilst more recently reconstructions have been carried out employing vitallium tubes (Warren Cole, 1946). But the very spate of operations implies not only a multiplicity of varying conditions, but also an uncertainty of end-result when universally applied.

Exposure and isolation of the strictured or severed duct and its reconstruction or anastomosis is often one of the most difficult feats in surgery. It is made through a region in which adhesions, the result of the irritation of the leaking bile, add to the difficulties. It is also a long procedure and one to which the type of patient suffering from gall-bladder disease may not respond well. Moreover, apart from the dangers of an immediate intraperitoneal leak of bile or intestinal content, successful anastomotic operations are not without delayed post-operative complications. Not only may delayed stricture result, but, in addition, when a short severed stump of duct is anastomosed to the intestine regurgitation of bowel content may give rise to recurrent attacks of cholangitis. Warren Cole (1946) has emphasized that regurgitation into the biliary tract may occur even when the anastomosis is made into a defunctionalized loop, and recommends plicating the intestinal wall in order to produce a system of infolded valves which will eliminate the passage of intestinal content back towards the liver.

Waltman Walters (1931) has reported a series of cases in which the fistula has been dissected out down to the region of its origin, with subsequent implantation into the intestinal tract. Although this is a procedure less intricate and time-consuming than dissection and re-establishment of continuity of the biliary ducts, it, too, has disadvantages. The actual dissection of the fistula far into the abdomen is not easy, as its course is lost in a mass of dense fibrous adhesions. The tract can readily be opened or injured often without the operator being aware that such damage has taken place. To reduce this risk, prior to such an operation some surgeons inject coloured dyes into the fistula so that injury may be observed at once by the escape of the coloured fluid. Leakage, if passed unnoticed, will give rise to biliary peritonitis or at best re-establishment of the fistula. Moreover, the dissection of such a tract must interfere with its blood-supply, so that resultant fibrosis with partial or complete obliteration is always a possibility.

The operation now to be described, consisting essentially in extraperitoneal anastomosis of fistula and bowel, has advantages. It may have disadvantages yet to be discovered as well, but it has the merit that it is simple to perform and is unlikely to be accompanied by mortality. Regurgitation of intestinal content is not probable in the exteriorized and defunctionalized loop of bowel, which is further protected from fæcal contents by the close suturing of the abdominal wall around the intestine as it leaves the abdomen. The natural constriction that forms about a colostomy will form around this loop of gut and will stimulate the infolded valves that Warren Cole has described as essential for the prevention of upward spread of intestinal content towards the liver. Finally, the operation entails only a minimum of dissection of the fistulous tract, so that its blood-supply will not be interfered with and the risk of stenosis and injury is therefore minimized.

PROCEDURE

(*Fig.* 521)

The fistula with a surrounding area of skin and subcutaneous tissue $\frac{1}{2}$–$\frac{3}{4}$ in. in diameter is dissected out as far as its point of emergence from the muscle layer of the abdominal wall.

The abdomen is then opened through a paramedian incision some 3 in. in length placed below the level of the original laparotomy wound, so that when the peritoneum is incised, the incision into the peritoneal cavity is below the site of adhesions in relation to the transperitoneal course of the fistulous tract.

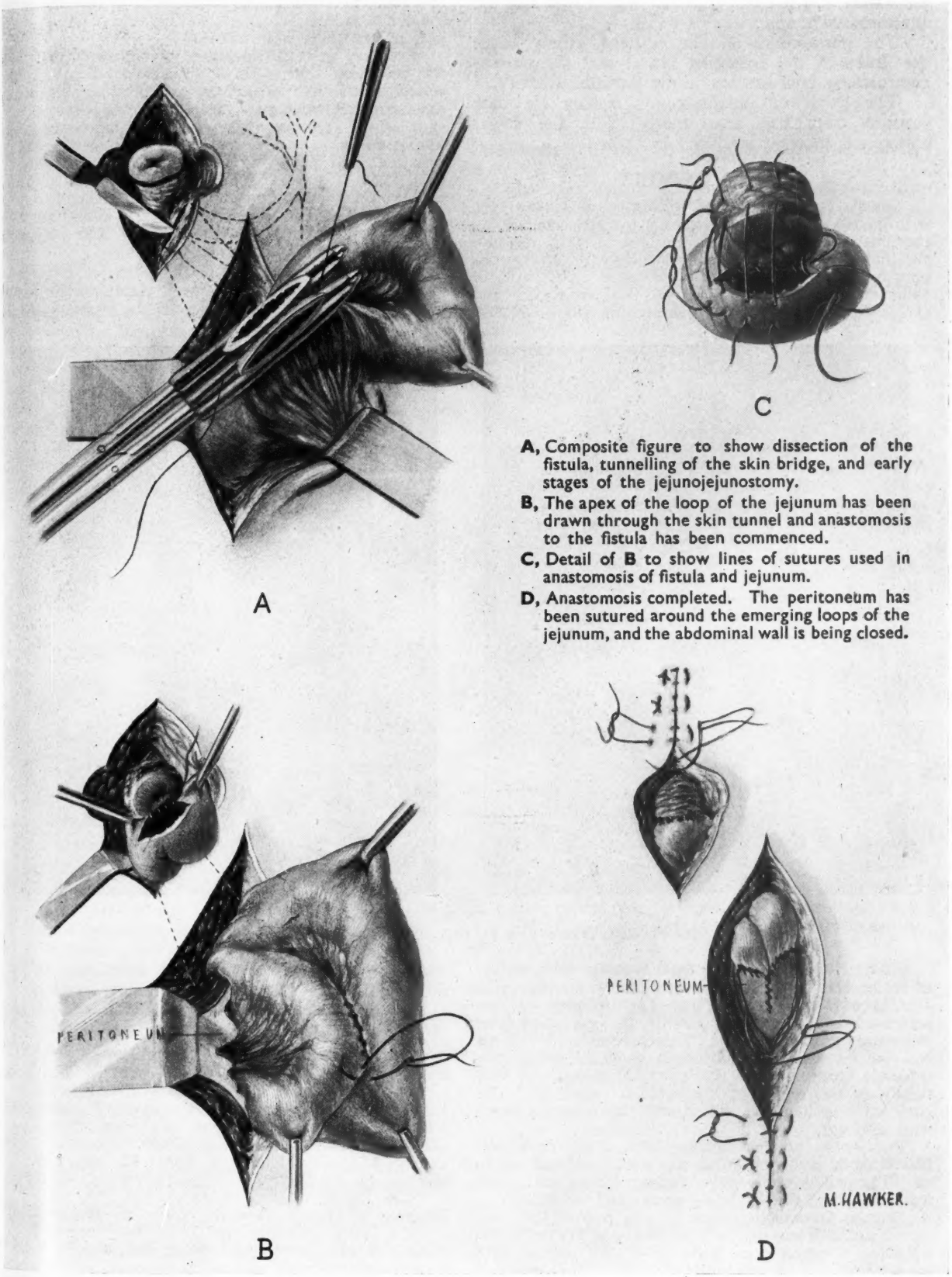
A loop of jejunum is then identified and pulled out through the wound. An entero-enterostomy some 2 in. long is then carried out between the afferent and efferent limbs of the loop, placed sufficiently away from the apex of the loop so that at the completion of the operation the anastomosis shall be intraperitoneal in position.

A tunnel is then fashioned in the subcutaneous tissue, lying beneath the skin bridge between the two incisions, and the loop of intestine is then drawn up towards the isolated head of the fistula through this tunnel. The apex of the loop is manipulated so that, without being under tension whatsoever, it lies close up against the dissected fistula.

The anastomosis between the fistula and the bowel is then carried out.

Interrupted thread sutures are used to stitch the subcutaneous tissue just below the skin surrounding the fistulous orifice to the seromuscular coat of the bowel. The bowel is then opened and the posterior layer of the anastomosis completed by suturing the skin edge to the bowel with interrupted chromic catgut sutures.

The anterior anastomosis is similarly performed in two layers. Finally a few reinforcing stitches are inserted between the subcutaneous covering of



A, Composite figure to show dissection of the fistula, tunnelling of the skin bridge, and early stages of the jejunojejunostomy.

B, The apex of the loop of the jejunum has been drawn through the skin tunnel and anastomosis to the fistula has been commenced.

C, Detail of **B** to show lines of sutures used in anastomosis of fistula and jejunum.

D, Anastomosis completed. The peritoneum has been sutured around the emerging loops of the jejunum, and the abdominal wall is being closed.

FIG. 521.

the fistula and the seromuscular bowel wall and the anastomosis is completed.

The peritoneum is then sutured snugly about the limbs of the emerging bowel and the entero-enterostomy now lies inside the peritoneal cavity.

The skin and subcutaneous tissues are then sutured over the anastomosis, and the lower abdominal incision is closed in layers.

CASE REPORT

Female, aged 68. Typical history of biliary colic with jaundice on three occasions. Admitted to hospital previously, but in view of hypertension (B.P. 185/100) and dilated heart and chronic bronchitis with emphysema, operation had been avoided. Straight radiograph of abdomen showed calculi in gall-bladder region and cholecystogram showed non-functioning gall-bladder.

Admitted Jan. 20, 1948, slight jaundice with history of recurrent attack of similar pain three days ago.

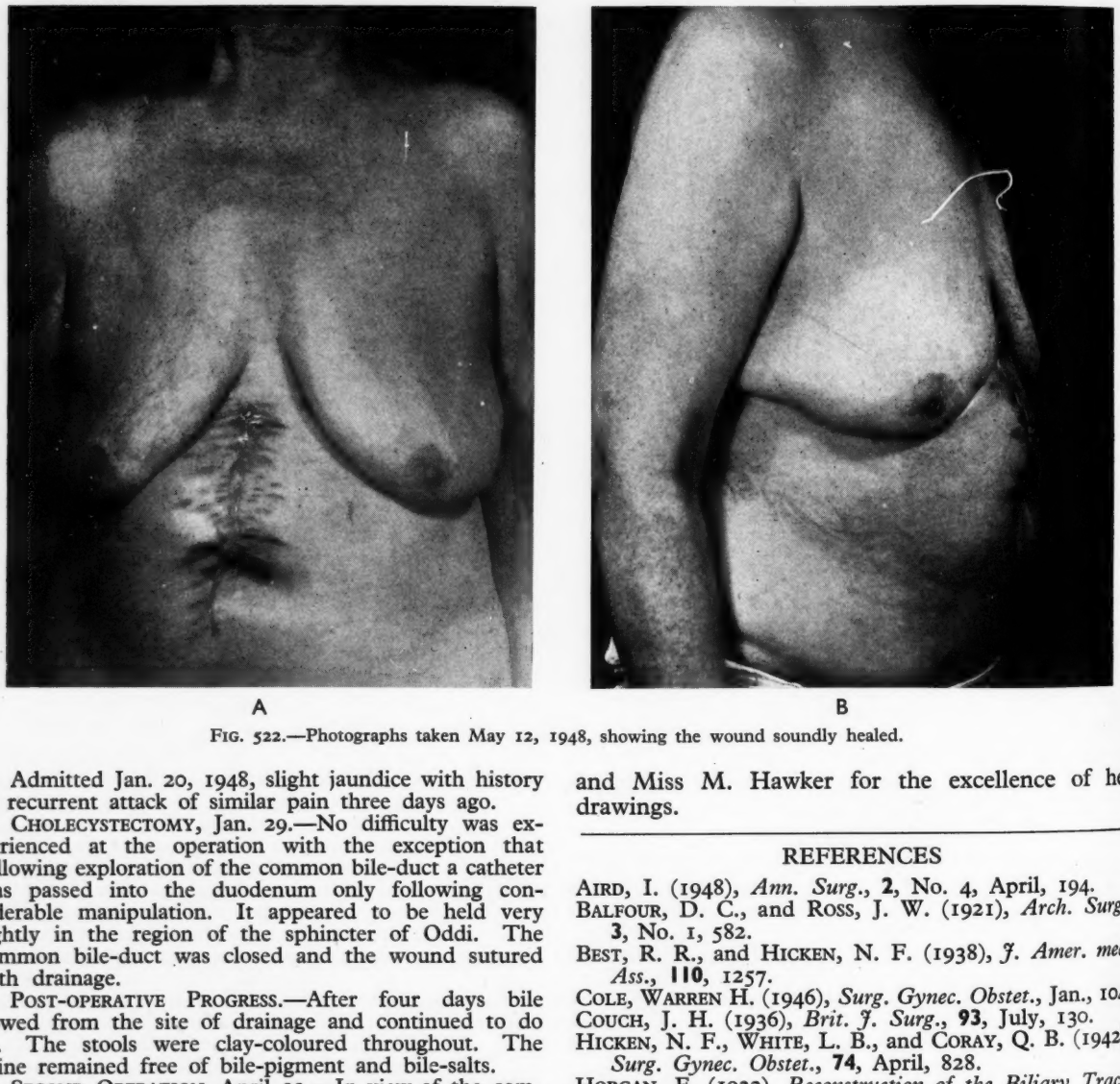
CHOLECYSTECTOMY, Jan. 29.—No difficulty was experienced at the operation with the exception that following exploration of the common bile-duct a catheter was passed into the duodenum only following considerable manipulation. It appeared to be held very tightly in the region of the sphincter of Oddi. The common bile-duct was closed and the wound sutured with drainage.

POST-OPERATIVE PROGRESS.—After four days bile flowed from the site of drainage and continued to do so. The stools were clay-coloured throughout. The urine remained free of bile-pigment and bile-salts.

SECOND OPERATION, April 23.—In view of the complete absence of any signs of cessation of biliary discharge, following a preliminary build-up of the patient with transfusions and intramuscular vitamin K, the operation described was carried out. It was considered pre-operatively that on account of her cardiac and pulmonary condition the patient would not stand the prolonged operation necessitated by dissection of the region of the common bile-duct and it was because of this that the present procedure was evolved.

Recovery from the operation was uninterrupted, with the exception that a small abscess developed in the subcutaneous tissue about the anastomosis, presumably due to fæcal contamination. This was drained. In spite of this, from the day of the operation there has not been leakage of one drop of bile. The stools rapidly returned to normal colour and the patient to good health. (*Fig.* 522.) The extraperitonealized loop of gut has given rise to no discomforting symptoms, and so far there is no evidence of ascending infection of the biliary tract or of recurrent jaundice due to stenosis. The patient is back to her household duties.

I would like to thank Miss J. Hunt, of the Royal Cancer Hospital, for the photographs of the patient; and Miss M. Hawker for the excellence of her drawings.



A B

FIG. 522.—Photographs taken May 12, 1948, showing the wound soundly healed.

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URINARY INCONTINENCE DUE TO ECTOPIC URETER

By G. F. LANGLEY, Ipswich

A SUPERNUMERARY kidney is a fairly common abnormality of the renal tract and may cause no symptoms. The ureter of the supernumerary kidney is usually only doubled in its upper part and a full-length duplication of the ureter is uncommon. Most supernumerary kidneys are fused with their fellow—a true, free supernumerary kidney is very rare.

Ectopic or extravesical opening of the supernumerary ureter is very rare, and Scott (1944) estimated that about three hundred cases had been reported in the literature in females.

Incontinence is the usual presenting symptom of ectopia of the ureter in females, but in males symptoms may be absent, or may be of obstructive or infective nature, and incontinence does not occur.

Fused Supernumerary Kidney.—The fused supernumerary kidney is one of the commonest renal abnormalities and its main features have been excellently summarized by Nation (1944) as follows :—

1. Incidence : During intravenous pyelography 2·7 per cent of cases presented duplication of the renal pelvis on one or both sides. These investigations were on selected patients, and in an unselected series of post-mortem examinations the frequency was 1 in 16,000 bodies.

2. Sex : Females were affected 27 per cent more often than males.

3. Unilateral duplication is ten times commoner than bilateral.

4. Age at onset of symptoms is usually above 30 years.

5. Either side may be duplicated with equal frequency.

6. Bilateral duplication is 10 per cent commoner in females and more often causes symptoms.

7. Renal disease discovered only at post-mortem examinations is not more frequent in the presence of duplication, but if observed was found to affect only the duplicated side in 50 per cent of cases and the normal side alone in 30 per cent. This supports the pyelographic findings indicating that unilateral renal disease affects a duplicated kidney more often than a normal one and conversely that duplication increases the possibility of disease developing.

8. Blood-pressure readings were normal or low in the presence of duplication unless other recognized factors were present.

9. Complete, whole-length duplication of the ureter occurs more frequently when bilateral renal duplication exists and renal disease is then more frequent.

10. An ectopic ureter occurred in 3 per cent of cases when the whole length of a ureter was duplicated.

Smith and Orkin (1945) found that 3·7 per cent of 471 pyelographies showed a supernumerary kidney and demonstrated the following features :—

a. Males were more often affected than females.

b. Symptoms usually developed at an average age of 37 years.

c. Only 17 per cent of cases were symptomless.

d. Pain occurred in 78·9 per cent of patients with renal duplication without any other disease to account for it.

e. Infected hydronephrosis and calculus were the usual cause of symptoms in 89 per cent of those cases which complained of symptoms.

f. Surgical intervention was necessary in 29 per cent of cases presenting renal duplication.

Ectopic Ureters.—Fraser (1938) suggested that 1 person in 130,000 was born with an ectopic ureteric orifice.

Scott (1944) observed that " in the majority of cases duplication occurs on the side of the aberrant ureter and not on the opposite side ".

Crenshaw (1940) reported 13 cases in which no duplication was present on the side opposite to the aberrant ureter. Scott found in the literature several cases of duplication of a part of the opposite ureter in the presence of ureteric ectopia on one side, but unless bilateral ectopia was present, he found no instance in which the whole length of each ureter was duplicated.

Burt, Lane, and Hamilton (1941), in reporting cases of triplicate ureters from fused supernumerary kidneys, found in a girl of 17 years suffering from incontinence double ureters which passed from the lower portion of the right kidney to twin bladder orifices and a third which emerged from the upper renal component to enter the vestibule.

Site of the Aberrant Ureteric Orifice.—Abeshouse (1944) stated that in the female the orifice may be in the urethra, vestibule, vagina, Fallopian tube, or uterus, and usually causes incontinence ; in males the openings occur in the posterior urethra, vas deferens, seminal vesicles, or ejaculatory ducts, and are thus above the sphincter vesicæ and do not cause incontinence, but may result in infection or obstruction of the affected renal segment.

Andrews and Vernon (1944), when reporting their case of an ectopic orifice in the vaginal vault of a girl of 12 years, found only 5 other reports of orifices at or near the cervix.

Baines (1941), in reporting a Grawitz tumour accompanied by an ectopic ureter entering the prostatic urethra, quoted Thom's analysis (1928) of the sites of orifices in 175 cases as :—

Urethra	70
Vestibule	45
Vagina	32
Seminal vesicles	17
Unspecified	11

Baines further quotes Sargent's (1930) statement that in 63 males found to have ectopic ureters a correct clinical diagnosis was only made six times, whereas in 123 females the correct diagnosis was made in 94 patients.

Gloor (1938), reviewing the literature, found 271 cases of ectopic ureter in females. *Table I* is incomplete, but is inserted to indicate the relative frequencies of the sites of aberrant orifices in females.

Table I.—Site of Ectopic Ureteric Orifices in 230 Cases with Fused or True Supernumerary Kidneys

	Author	Year	Patients	Total
Urethra	Eisendrath and Rolneck (review)	1938	70	
	Scott	1944	2	
	Green and Ferris	1946	1	
	Author (Langley)	1948	1	74
Vestibule	Eisendrath and Rolneck (review)	1938	88	
	Burt and others (Triple ureter)	1941	1	
	Green and Ferris	1942	1	
	Scott	1944	1	
	Headings and Palmer	1946	1	
	Flagg	1946	1	93
Vagina	Flagg (review)	1946	61	
Cervix	Andrews and Vernon (state only six cases in cervix)	1946	1	
Uterus	Hepler (bilateral)	1947	1	63

Scott (1944) estimates 300 cases recorded, but only those with details available to author are included in above to show relative incidence of various ectopic orifices.

True Supernumerary Kidney.—Geisenger (1939) defined a true supernumerary kidney as one which is possessed of a complete capsule separate from its fellow; a completely separated vascular pedicle; a distinct drainage system; and is either unconnected with its fellow or only attached by loose areolar tissue. This author added 2 cases to those previously reported in the literature, bringing the total to 40; Hanley (1943) added further cases, bringing the total to 43. Hanley stated that the true supernumerary kidney is usually situated below its fellow and its ureter may join its fellow or end extravesically; a double orifice in the bladder is rare. This finding contrasts with Weigert's law

Table II.—True Supernumerary Kidney

Author	Year	Patients	Total
Hanley (review)	1943	43	
Headings and Palmer—case	1946	1	
Shane (quoted by Flagg)	1942	1	
Flagg—case report	1946	1	46
Ectopic Ureters in above Cases			
Headings and Palmer—vestibule (plus review)		1+6	
Flagg—vestibule		1	8

affirming that the upper pelvis of a fused supernumerary kidney that is supplied with a whole-length ureter empties into the lower of the twin orifices in the bladder: Malgras (quoted in the *Year Book of Urology*, 1937) asserts that exceptions to Weigert's law have been known.

Headings and Palmer (1946) reported a case of ectopic ureter entering the vestibule, arising from a free supernumerary kidney; in the 44 case reports of true supernumerary kidney previously recorded, there were 6 instances of extravesical orifices, and in only 2 of these was a correct pre-operative diagnosis made.

Flagg (1946) diagnosed correctly a vestibular ectopic ureter arising from a true supernumerary kidney in a girl of 7; previous investigations by several physicians had failed to diagnose the cause of her incontinence, which only occurred in the vertical posture; heminephrectomy of the supernumerary kidney lying superior to the normal organ cured her. Flagg reports that, with Shane's (1942) case, which had a vaginal orifice, this case makes the eighth example of extravesical orifice of the ureter leading from 46 true supernumerary kidneys, and 4 of these were correctly diagnosed pre-operatively (*Table II*).

Embryology.—Many authors have reviewed the embryology of the supernumerary kidney; the primitive pronephros and mesonephros atrophy and take no part in the permanent renal system, but the metanephros, arising from the renoblast in the mesochyme, caps each ureteric bud arising from the Wolffian duct. These buds may be paired or triplicated on each side and their dilated pelvic extremity eventually joins with the excretory system of its own metanephric cap. In the ascent of the growing ureteric bud dorsally and then cranially from the lower end of the Wolffian duct the two ureters may cross each other, but the upper of paired buds develops first and meets the metanephric mass first, so that when an accessory lower bud grows it is almost inevitably forced to develop connexions with the metanephros above the former; the lower ureteric orifice, therefore, connects with the upper kidney when fused supernumerary kidneys exist. Bifurcation of the ureter after its origin from the Wolffian duct or of its pelvic expansion produces the various forms of renal duplication draining through a single vesical orifice. Aberration of the second bud allowing its contact with the metanephros at some distance from the former bud and the formation of a separate vascular supply to the supernumerary metanephros accounts for the rare development of the true supernumerary kidney and the uncertainty of its position.

In the male the Wolffian duct is incorporated in the excretory system of the testis and prostatic urethra, thus accounting for the various sites of the aberrant orifice above the sphincter vesicæ.

In the female it becomes essential to postulate a break through between the Wolffian and Müllerian duct systems to explain the presence of an aberrant ureteric orifice in the vagina, uterus, or Fallopian tubes which are of Müllerian origin (Winterton, 1937). The urethral and vestibular orifices are consistent with a similar Wolffian abnormality to that occurring in the male, but the absence of an external sphincter results in incontinence.

Symptoms.—In females ureteric ectopia almost invariably results in incontinence and sterility owing to the constant vaginal irritation. Scott has pointed out that the incontinence in this condition is superimposed upon normal regular micturition. Many authors have noted that the incontinence is only evident when the patient is ambulatory, and it may be intermittent. In Scott's fourth case a girl of fourteen years only became incontinent after hymenotomy for a hæmatocolpos and there was presumably an intravaginal ureteric orifice, but it was never located, though removal of the supernumerary kidney cured the incontinence.

In males incontinence is not present, but varied symptoms suggestive of renal obstruction, increased frequency, dysuria, and recurrent pyelonephritis have been described. It may be advantageous to consider the possibility of ureteric ectopia more frequently in view of the failure of demonstration of a supernumerary kidney by pyelography in some cases.

Diagnosis.—Incontinence of the type described by Scott in females demands full investigation to confirm the provisional diagnosis, but in the present case, and in many others previously described, confirmation is exceedingly difficult.

If duplication of one or both kidneys is demonstrated by intravenous pyelography, even though the ectopic ureteric orifice cannot be seen in any of the usual sites, heminephrectomy should be considered. In Green and Ferris's (1942) two cases, aged 26 and 9 years respectively, bilateral ectopia existed and unilateral heminephrectomy failed to cure the incontinence: although the second ureter was not evident in one of these cases, the trouble in each was cured by heminephrectomy of the opposite fused supernumerary kidney.

In many cases the secretory power of the supernumerary kidney is insufficient to provide positive demonstration of the supernumerary pelvis and ureter, even with a double injection of contrast medium.

Indirect evidence of renal duplication may be provided in either ascending or intravenous pyelography by what might be described as the 'pelvi-renal discrepancy test':—

a. A large renal shadow with a small renal pelvis in proportion.

b. Absence of a drainage system for the upper part of the large kidney, with a normal pelvis for the lower part.

c. Sometimes lateral displacement of the pelvis of such a kidney.

Combined intravenous and ascending pyelography might aid in the elucidation of difficult cases, but even this failed in the present patient owing to inability to catheterize the normal ureters. Injection of pitressin before intravenous pyelography might also increase the density of the renal shadow, allowing the discrepancy to be more easily demonstrable.

Cystoscopy is necessary to establish the presence of normal ureteric orifices but the hazard of Burt's case, already quoted, in which double right ureters were present with an additional right ectopic ureter should be noted.

Indigo-carmine excretion, apart from demonstrating the normal ureteric orifices on cystoscopy, is unlikely to aid in visualizing an ectopic ureter if the functioning power of the supernumerary kidney is insufficient to allow its visualization by intravenous pyelography.

Injection of indigo-carmine into the bladder and inspection of the possible sites of fistula development will exclude the presence of a vesicovaginal fistula.

Very minute search of the commonest sites of ectopic ureteric orifices must be conducted and any possible crypts explored with fine probes; catheterization of an ectopic ureter and contrast radiography remains the crucial diagnostic test whenever possible.

The tortuous, dilated ectopic ureter acts as a reservoir for the small urinary output from the supernumerary kidney in many cases, and, as incontinence may be absent in recumbency, examinations should sometimes be made in lateral or erect postures.

Treatment.—All authors agree that heminephrectomy is the ideal treatment, but this may be impossible at times without endangering the normal kidney.

Hepler (1947) resected only the ureter because in his case of bilateral ectopia, in which the left ureter entered the cervix and the right ureteric orifice was not discovered, both supernumerary kidneys were hydronephrotic and a safe heminephrectomy was impossible.

Flagg's second case, aged 35 years, resembled the present case in that he diagnosed a pelvic ectopic supernumerary kidney with a vestibular ureteric orifice; at laparotomy he found a fused supernumerary kidney with aplasia of the normal portion and resected the ectopic ureter only but left the upper end under the rectus fascia after ligation with black silk for easy identification should a hydronephrosis or fistula ensue.

Everitt (1938) considered that excision and ligation of the ectopic ureter was adequate if the volume and functioning power of the supernumerary kidney were small.

Conservatism has very rarely been considered necessary and the anastomosis of the ectopic ureter to its fellow, re-implantation into the bladder, or transplantation into the normal renal pelvis or bowel, would only be necessary if the supernumerary kidney were the only reliably functioning organ; it is unlikely that surgery would be considered in such circumstances.

CASE REPORT

Daphne P., an only child, was first seen at the East Suffolk and Ipswich Hospital Out-Patient Department, at the age of 4½ years in August, 1944.

HISTORY.—A healthy child, but had wet herself since birth in spite of normal micturition. Incontinence occurred chiefly by day, but also at night in spite of being wakened for voiding. Apart from measles, she had had no serious illnesses. "She missed her daddy, who was abroad in the Army" and was sometimes irritable. Bowel control was normal.

ON EXAMINATION.—A well-developed child, quite intelligent, and, apart from a slight dampness of the vulva and knickers, no abnormality was detected after full examination. Rectal tone was normal and no obvious neurological lesion was found.

X-ray examination of the spine showed lack of fusion of the spines of the first three lumbar vertebræ.

Intravenous Pyelography demonstrated a moderate hydronephrosis and upper hydro-ureter on both sides, but there was no obvious discrepancy between the pelvic and renal outlines and no duplication of the kidneys.

PROVISIONAL DIAGNOSIS.—Ureterovaginal fistula.

ON ADMISSION.—She was admitted for investigation on Feb. 2, 1945. Blood-urea was 20 mg. per 100 ml.; a catheter specimen revealed some pus cells and a small growth of *B. coli*.

Cystoscopy in the lithotomy position under anæsthesia revealed slight trigonitis, but otherwise no abnormality;

both ureteric orifices appeared normal; indigo-carmine excretion occurred from the left ureter strongly in six minutes, but was absent from the right after twelve minutes. Catheters were obstructed 1·5 cm. from each ureteric orifice and ascending pyelography was impossible. Indigo-carmine injected into the bladder did not leak into the vagina. Inspection and probing of the vagina through a speculum revealed no ureteric orifice or urinary leakage.

Careful Observation in the ward and the wearing of pads revealed no incontinence until her discharge one week later; she was treated for the *B. coli* infection and doubts were cast upon my provisional diagnosis.

FOLLOW-UP in the out-patient department revealed incontinence by day but not often at night and she was referred to Dr. P. Banbury in the Psychological Department: no gross mental or psychological disorder was found apart from the disturbance due to the absence of her father, and sedation, etc., failed to improve her incontinence.

FIG. 523.—Pre-operation film. Intravenous pyelogram, at 15 minutes, no compression. Hydronephrosis of right kidney.

RE-ADMISSION.—She was re-admitted with a diagnosis of suspected ectopic ureter on Aug. 17, 1946. Ward observation confirmed incontinence of a slight degree by day in spite of regular normal micturition, but only twice was there any night leakage. A mild *B. coli* infection was again treated.

Cystoscopy on Sept. 6 demonstrated a normal bladder capacity and fairly good dye excretion from both ureteric orifices. The ureteric catheters were again obstructed at similar sites. No ectopic ureteric orifice could be found. Intravenous pyelography and blood-urea estimations revealed no change.

THIRD ADMISSION.—She was again admitted on Nov. 13, 1947, with the same provisional diagnosis. Night leakage now never occurred and the day leakage was not always present and was never of great amount. Her urine contained a small amount of pus, and culture showed infection by *B. coli* and *proteus*. Intravenous pyelography was unchanged (*Fig.* 523).

Cystoscopy, under anæsthesia in the lithotomy position, on Nov, 17, 1947, showed slight trigonitis; indigo-carmine excretion occurred in fairly good concentration from the left ureter in eleven minutes and from the right in twenty-five minutes. Ureteric catheters were similarly obstructed and ascending pyelography was impossible. During meticulous searching of the vestibule, vagina, and urethra, a minute dimple was observed in the midline of the urethra about 1 mm. from its external orifice. Only the eye of a needle could be introduced at first but dilatation allowed the passage of a fine ureteric catheter upwards for 12 cm. About 15 ml. of clear fluid was aspirated from the ectopic ureteric catheter and the pathological report subsequently proved this to be 'dilute urine'.

Further attempts at catheterization of the normal ureters failed and an ascending pyelography of the ectopic ureter was then performed without changing the position of the patient (*Fig.* 524).

Combined intravenous pyelography with pyelography of the ectopic ureter was immediately conducted (*Fig.* 525).

Interpretation of the Pyelography.—The ectopic ureter was of about 12 cm. in length; it ran a tortuous course through the left side of the pelvic cavity and presented a slight narrowing at about the level of Mackendrodt's ligament, and again at the posterior edge of the iliac crest, where it turned outwards to end in an irregularly ovoid cavity; this dye-filled cavity suggested the appearance of a dilated renal calix viewed end-on in the upper part and at its lower extremity there appeared to be a dilated cupped calix. Only an indefinite trace of dye appeared at the upper part of this and the appearance strongly suggested a malformed, hydronephrotic, free supernumerary kidney lying at the left pelvic brim.

The combined intravenous pyelography superimposed upon this picture showed, on the right side, a considerable hydronephrosis (possibly larger than formerly because of the lithotomy position) and a dilated upper right ureter. On the left side a considerable hydronephrosis was demonstrated and a gross hydro-ureter extending above the globular 'pelvic kidney shadow'. It was thought that the ascending injection of the ectopic ureter and kidney had obstructed the normal ureter to a greater extent than demonstrated previously. No trace of the ectopic ureter could be identified above the 'pelvic kidney'.

Further check intravenous pyelography four days later showed a little left hydronephrosis and hydro-ureter, though an obstruction of this ureter was still evident at the site of the suspected 'pelvic kidney'.

Subsequent review of these films after operation now suggests that in the combined film, taken at the cystoscopy, a filling of the fused, supernumerary renal pelvis had occurred but its significance was not appreciated at that time; it was not so evident in the later film and the upper part of the ectopic ureter could not be defined.

A diagnosis of ectopic urethral orifice of the ureter of a free supernumerary kidney was made.

OPERATION (Nov. 28).—Under general anæsthesia with the patient in the semilateral position an oblique flank incision was made, after having attempted, again unsuccessfully, to pass catheters up the normal ureters. A catheter inserted into the ectopic ureter acted as a guide to that organ. After reflecting the peritoneum no pelvic kidney was found. The ureteric catheter in the ectopic ureter was felt to be lodged in a pouch of a grossly dilated and tortuous ureter in which there seemed to be a stricture just above the iliac crest. The ectopic ureter was about 2 cm. in diameter and was loosely connected

FIG. 524.—Ascending pyelogram of ectopic left ureter, suggesting possibility of left pelvic supernumerary kidney at iliac crest.

FIG. 525.—Combined intravenous pyelogram plus ascending pyelogram performed through ectopic ureteric catheter, suggesting obstruction of left ureter by ectopic ureter at iliac crest.

FIG. 526.—Post-operation film. Intravenous pyelogram at 15 minutes (at three months).

FIG. 527.—Post-operation film. Intravenous pyelogram at 30 minutes (at eight months).

to the anterior surface of a more normal but rather dilated ureter which entered the renal pelvis. The ectopic ureter passed anteriorly to the renal pelvis and at its upper extremity no obvious pelvis existed and very little supernumerary renal tissue was evident. Resection of 8 in. of the ectopic ureter was performed, the ends were diathermized and ligated with thread. After reflecting the peritoneum both normal ureters were opened through small incisions and bougies were passed down with slight difficulty in the hope of dilating their intramural obstructions. The ureters were not sutured and some leakage of urine occurred for several days via the corrugated rubber drainage established when the wound was closed.

PROGRESS.—Healing occurred satisfactorily and she was discharged on Jan. 3, 1948. No incontinence occurred after the operation.

Follow-up : When last seen in February, 1949, her health was excellent and no incontinence had occurred. Further intravenous pyelography and a further unsuccessful attempt to pass catheters up the normal ureters was conducted on March 2, 1948. The blood-urea remained normal and her urine sterile (*Fig.* 526). Intravenous pyelography on July 14 revealed no change in the right hydronephrosis though the left pelvic dilatation had improved slightly (*Fig.* 527).

Observation is continuing and the possibility of further treatment to relieve the hydronephrosis is being kept in mind.

PATHOLOGICAL DATA (*Dr. Trevor H. Shaw*).—

Blood-sugar 72 mg. per cent.

Blood-urea 22 mg. per cent.

Pre-op. Bladder Catheter Specimen : Urinary chlorides 710 mg. per cent. No epithelial cells, casts, or crystals. Occasional red cells. Moderate numbers of polymorphs present, few bacilli seen.

Culture : moderate growth *B. coli*, *B. proteus.*

Catheter Specimen from Ectopic Ureter : Specific gravity 1004. No sugar detected. No albumin detected. Chlorides 320 mg. per 100 c.c. Urea 220 mg. per 100 c.c.

Plasma-chlorides 581 mg. per cent (as NaCl).

Urine (24-hr. specimen) for T. B. : No acid-fast bacilli found.

Section of Excised Ectopic Ureter : Specimen consists of an elongated piece of tissue measuring 21 cm. in length. It has a smooth outer surface and measures in parts 1 cm. in diameter and in places has a somewhat distended lumen, but at one end the wall is considerably thickened and the lumen reduced to almost pinpoint dimensions.

Microscopical Examination : Sections have been made of seven portions of this ureter at different levels, including the point indicated by the cotton ligature. All show a patent lumen and some chronic inflammatory-cell infiltration in the subepithelial layer. The arrangement of the muscle-fibres in the wall appears normal.

SUMMARY

1. A case of incontinence due to an ectopic ureter arising from a fused supernumerary kidney has been described.

2. The main features of free and fixed supernumerary kidneys have been reviewed.

3. Symptomatology and the difficulties in diagnosis of ureteric ectopia have been discussed and the 'pyelorenal discrepancy test' in radiological examination has been shown to be unreliable when the bulk of the supernumerary kidney is small.

4. Sites of the orifices of the ectopic ureters in females have been tabulated to indicate their relative frequency.

5. Treatment of ureteric ectopia has been discussed.

It is a pleasure to acknowledge my indebtedness to Dr. Trevor H. Shaw for pathological investigations; the X-ray Staff and Nursing Staff for their co-operation; and my Surgical Registrar, Mr. C. W. Magill, for careful supervision. To Mr. C. F. Holbrook, of Ipswich, my special thanks are due for the photographic reproduction of the radiographs.

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PARTIAL HEPATECTOMY

By RONALD W. RAVEN, O.B.E., London

During recent times the scope of surgery in the treatment of cancer has been extended and patients with advanced disease have undergone operation with gratifying results in certain instances. It has been our experience to find some patients alive without recurrence many years after radical operation who were pronounced inoperable by surgeons or untreatable by radiotherapists. These results have been an encouragement to extend surgical treatment to a number of patients who are doomed to death but in a suitable condition for operation and where some measure of success is possible. In the presence of these problems the surgeon will do well to remember that " where there is everything to lose, one must dare much ".

The writer has been confronted on several occasions with the situation where there is a removable cancer of the colon or rectum and metastases localized to one area of the liver. In this connexion the experience of other surgeons has been helpful. Thus, in 1923, Grey Turner stated, " direct extension of malignant disease from the stomach or colon may render removal of a portion of the liver necessary, and I think this will become one of the most frequent indications, especially as it usually only involves the removal of a slice or wedge from the edge of the organ. In cases of this kind such an extension to the liver need not in itself to be a bar to successful operation if the extension of the growth in other directions rendered its removal profitable ". In 1940 the writer performed a right hemicolectomy for carcinoma of the hepatic flexure which invaded the right lobe of the liver, and it was necessary to remove a slice of liver with the growth ; this patient remains well without recurrence. In 1943 and 1945 Wangensteen performed coincidental partial hepatectomy with gastric resection for carcinoma of the stomach involving the liver by direct extension. In 1947 the writer described an operation which involved excision of the greater part of

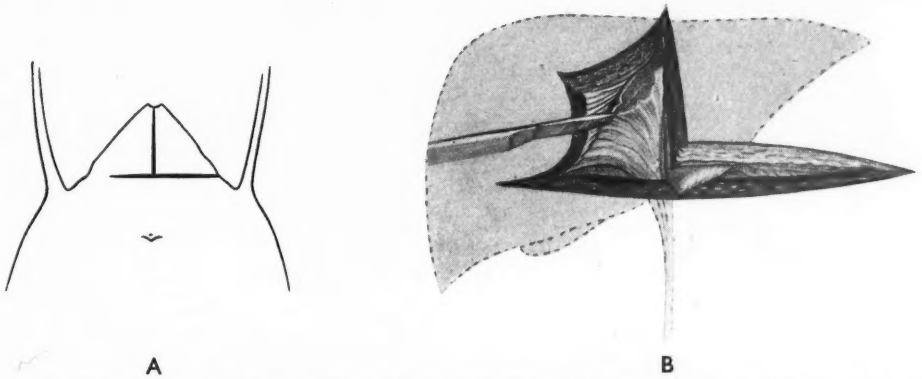

Fig. 528.—The incision is transverse, placed midway between the umbilicus and ensiform cartilage, the left extremity reaches the costal margin, the right extends 5 cm. beyond the midline. A second incision at right angles extends up to the ensiform cartilage. After the abdomen is opened the round ligament is divided.

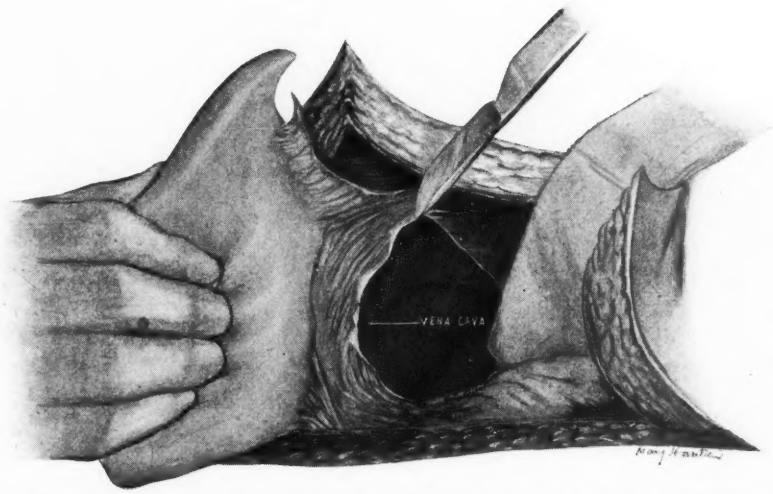

Fig. 529.—The left lateral ligament has been divided and the left lobe of the liver is retracted to the right ; the coronary ligament is being divided and the inferior vena cava is brought into view.

the right lobe of the liver together with right hemicolectomy for carcinoma of the hepatic flexure which invaded the liver by direct extension.

later date carry out excision of the left lobe of the liver. Other indications for left hepatectomy are primary carcinoma localized in the left lobe;

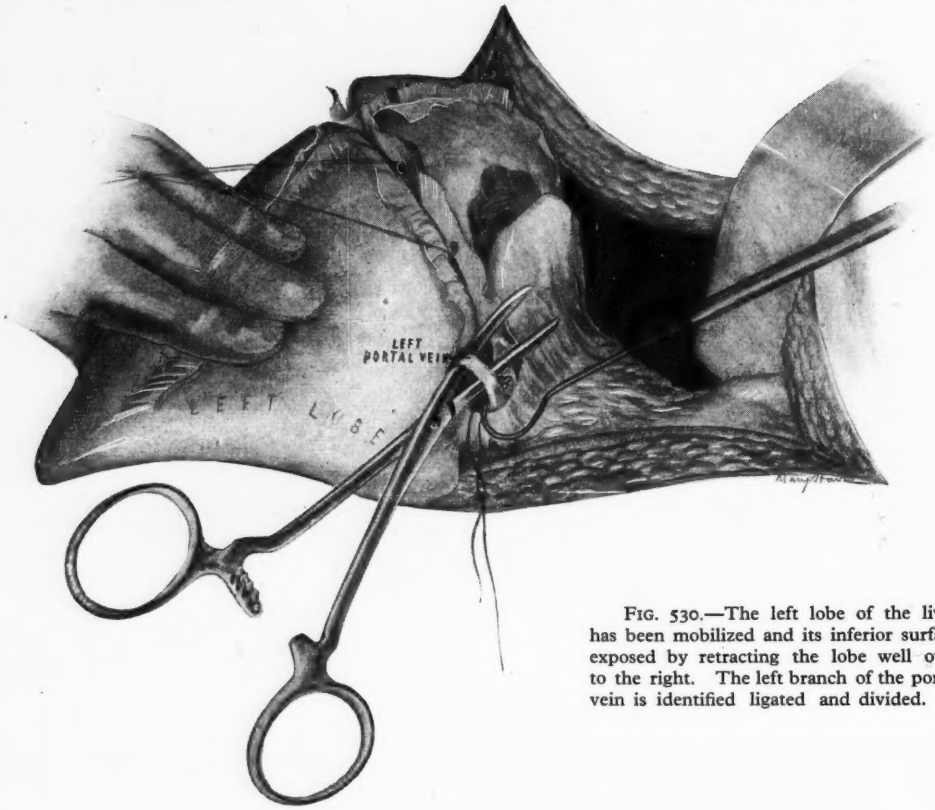

FIG. 530.—The left lobe of the liver has been mobilized and its inferior surface exposed by retracting the lobe well over to the right. The left branch of the porta vein is identified ligated and divided.

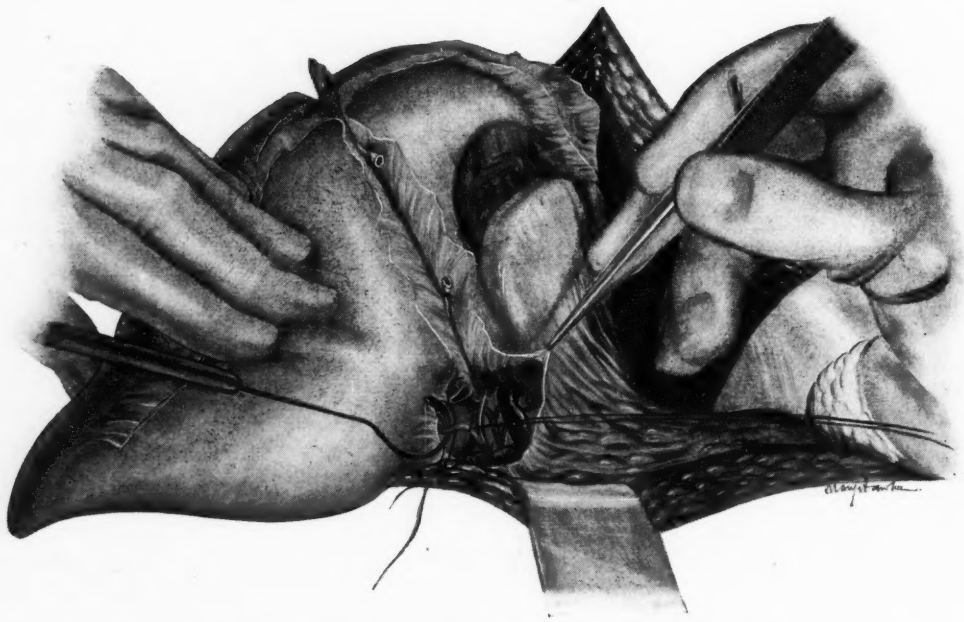

FIG. 531.—The left hepatic duct is identified, ligated, and divided.

There is a group of cases with a removable carcinoma of the rectum and metastases localized in the left lobe of the liver, no other demonstrable metastases being present. It is feasible to perform a radical excision of the rectum and at a

and carcinoma involving the left lobe by direct extension from the œsophagus or stomach.

In this paper the technique is described for left hepatectomy based upon operations on patients and dissections carried out on the cadaver.

FIG. 532.—The left branch of the hepatic artery is identified, ligated, and divided.

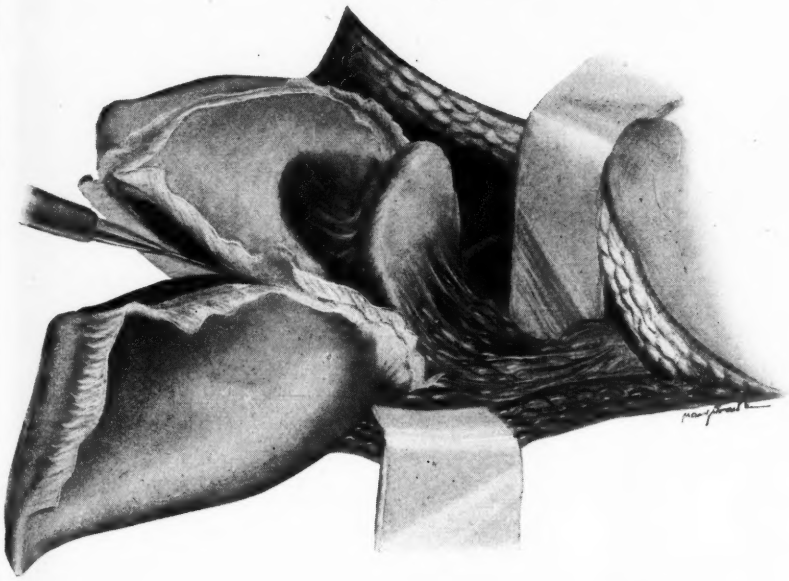

FIG. 533.—The left lobe of the liver is removed by dividing liver tissue with the diathermy knife, anteroposteriorly at the left extremity of the transverse fissure.

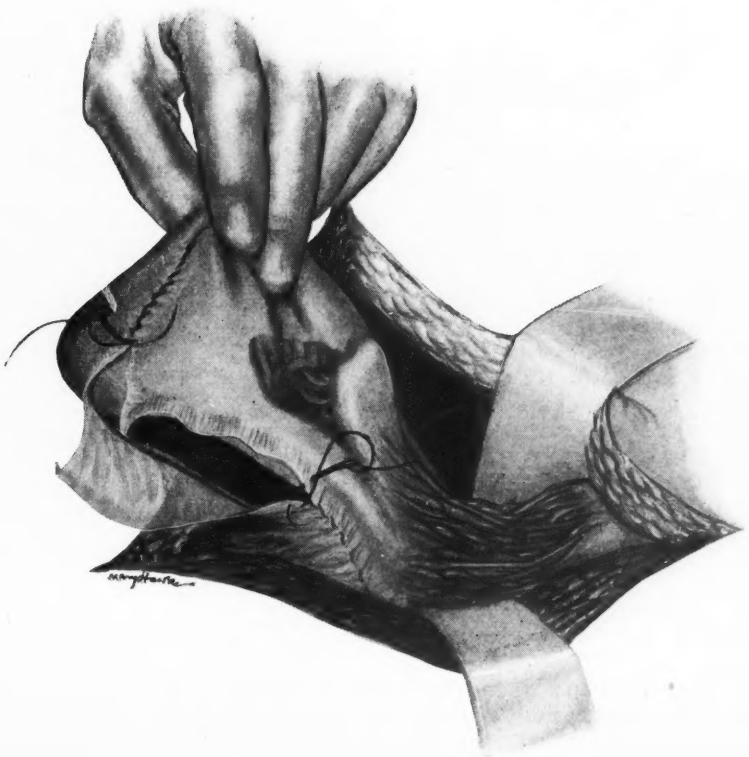

FIG. 534.—The cut area of the right lobe of the liver is covered by suturing the peritoneum derived from the divided longitudinal ligament with that from the coronary ligament and gastro-hepatic omentum.

TECHNIQUE OF LEFT HEPATECTOMY

Incision.—The abdomen is opened through a transverse incision placed midway between the umbilicus and ensiform cartilage, the left extremity reaching the costal margin, the right extending 5 cm. beyond the midline. A second incision is made in the midline which extends upwards from the transverse incision to the ensiform cartilage. Using this incision an adequate exposure is obtained of the liver (*Fig.* 528).

Mobilization of the Left Lobe of the Liver.—The left lobe is retracted with the left hand downwards and forwards and the left lateral ligament is divided. This is longer than the right lateral ligament and extends from the side of the diaphragm to be attached to the posterior aspect of the left extremity of the liver.

FIG. 535.—Photograph of left lobe of liver showing almost complete replacement with metastatic carcinoma—specimen removed by left hepatectomy.

The coronary ligament is divided next as far as its connexion with the longitudinal ligament. This is formed by the reflection of peritoneum from the under aspect of the diaphragm to the upper and lower margins of the posterior surface of the liver and is continuous with the left lateral ligament.

The longitudinal ligament is then divided; this is a broad peritoneal fold which is attached by one margin to the under-surface of the diaphragm and the posterior surface of the sheath of the right rectus abdominis muscle, and by the other margin to the upper surface of the liver extending from the notch in the anterior margin to the posterior surface. Finally, the round ligament is ligated and divided (*Fig.* 529).

Identification of Hepatic Blood-vessels and Ducts.—Having mobilized the left lobe of the liver, it is drawn well over to the right in order to expose the inferior surface. From this aspect the following are identified: the left branch of the portal vein is exposed, ligated, and divided; the termination of the portal vein is seen in the transverse fissure of the liver where it divides into two main branches, the left branch is longer but has a smaller diameter than the right branch (*Fig.* 530).

The right and left hepatic ducts are next identified on a deeper plane; these are nearly equal in size and, passing from their respective lobes of the liver, unite in the transverse fissure to form the common hepatic duct. The left hepatic duct is ligated and divided (*Fig.* 531).

The left branch of the hepatic artery is identified and divided between ligatures. The hepatic artery

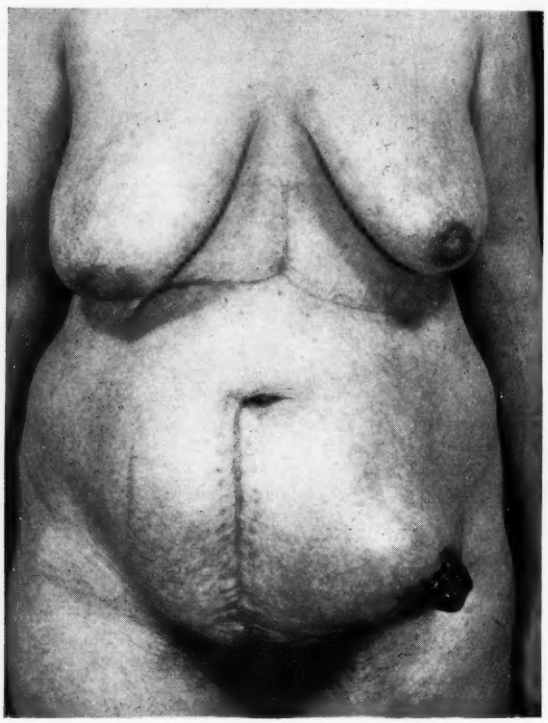

FIG. 536.—Photograph of patient after abdomino-perineal excision of rectum and left partial hepatectomy.

is intermediate in size between the gastric and splenic arteries and divides into its two terminal branches, the right and left hepatic, in the transverse fissure of the liver. From this aspect of the transverse fissure the relative position of these structures is as follows—the left branch of the portal vein is the most superficial, the left hepatic duct is on the right side of the left hepatic artery (*Fig.* 532).

The hepatic veins—usually three large veins are formed which pass towards the posterior surface of the liver and open into the inferior vena cava during its course in the groove in the posterior part of the liver. One vein passes from the right lobe and another from the left which open obliquely into the inferior vena cava; the third vein is from the middle of the liver and the Spigelian lobe and pursues a

straight course to open into the inferior vena cava. The left hepatic vein is identified and divided between ligatures.

Removal of the Left Lobe of the Liver.—This is carried out by dividing the liver tissue in an anteroposterior direction with the diathermy knife at the left extremity of the transverse fissure. There is very little hæmorrhage and this is controlled by diathermy coagulation (*Fig.* 533).

Peritonealization of the Cut Area of the Right Lobe of the Liver.—This is carried out by suturing the fold of peritoneum derived from the divided longitudinal ligament to folds of peritoneum formed from the coronary ligament and gastrohepatic omentum. The peritoneum covering the hepatic artery, common hepatic duct, and portal vein is sutured (*Fig.* 534).

Closure of the Wound.—The abdominal wound is closed in layers. The region of the divided liver is drained by a rubber tube which is brought out through the left extremity of the transverse abdominal incision. The tube is removed after forty-eight hours if there is no drainage of bile from the cut surface of the liver. Usually there is no drainage of bile.

ILLUSTRATIVE CASE-RECORD

Female, aged 52, admitted to hospital with diarrhœa, bleeding from the rectum, and loss of weight extending over a period of six months.

On examination she was thin and pale. There was a large, nodular, hard swelling in the position of the left lobe of the liver. On rectal examination an ulcerating carcinoma was found; the lower margin of the growth was 7·5 cm. from the anal verge and somewhat fixed anteriorly.

OPERATION (*March* 23, 1948).—Abdominoperineal excision of the rectum.

OPERATION (*April* 20).—Left hepatectomy; the whole of the left lobe of the liver was massively involved by metastases (*Fig.* 535); the right lobe was clear. Microscopical examination showed adenocarcinoma of the rectum and liver.

FOLLOW-UP EXAMINATION.—The patient remains well and when seen in September there was no sign of recurrence. (*Fig.* 536.)

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IMMEDIATE SKIN-GRAFT IN RADICAL MASTECTOMY

A PLEA FOR A MORE FREQUENT ADOPTION OF THIS METHOD

BY CHARLES WELLS AND DAVID ANNIS
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WE believe that immediate split skin-grafts may frequently be used with advantage in radical amputation of the breast. The obvious need for grafting arises in cases where the growth is in an awkward situation and in which the flaps do not come together. A second group of cases includes those on the border-line of operability because of the size of the tumour. A more subtle implication is that the surgeon may make a wider sweep if he knows that he can depend upon Thiersch grafting to cover the chest. Statistics are of interest in this connexion, for local skin recurrence is common following radical mastectomy. This is clearly shown by the following figures kindly supplied by the Director of the Liverpool Cancer Control Organization :—

Table I.—DETAILS OF PATIENTS HAVING RADICAL MASTECTOMY FOR CARCINOMA OF THE BREAST WITH OR WITHOUT RADIOTHERAPY DURING 1944 (176 *cases*)

RADICAL MASTECTOMY (55 Patients)		RADICAL MASTECTOMY WITH RADIOTHERAPY (82 Patients)		UNSATISFACTORY RECORDS (39 Patients)
Number without recurrence in 1948	**Number with recurrence between 1944 and 1948**	Number without recurrence in 1948	**Number with recurrence between 1944 and 1948**	
31 patients	24 patients	52 patients	30 patients	
	Skin Metastases / Metastases elsewhere		Skin Metastases / Metastases elsewhere	
	17 / 11		15 / 22	
	4 of these had metastases elsewhere (in 3 of which the skin nodules appeared first)		7 of these had metastases elsewhere (in 6 of which the skin nodules appeared first)	

Of 55 patients who had surgery alone and who, during 1947, appeared with recurrence, 23 had skin nodules. Of 6 patients in whom surgery was combined with radiotherapy and who had recurrence, 4 were found to have them in the skin. Thus 27 (44 per cent) out of 61 patients with recurrence had skin nodules.

Table I presents a series of 176 patients, who, during 1944, had radical removal of the breast for carcinoma, with or without additional radiotherapy given either immediately before or after the operation.

Fig. 537.

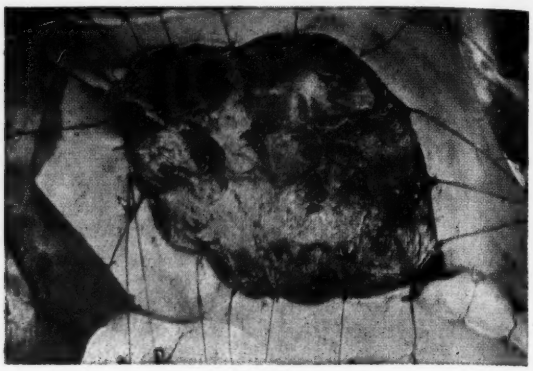

Fig. 538.

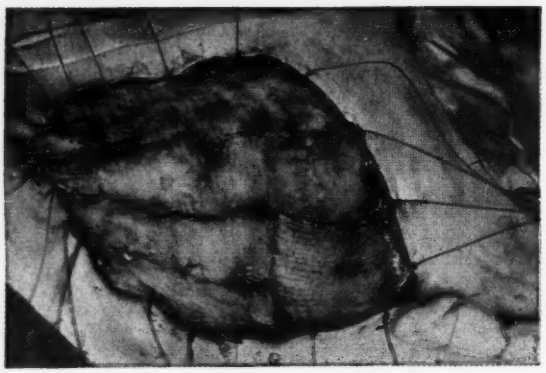

Fig. 539.

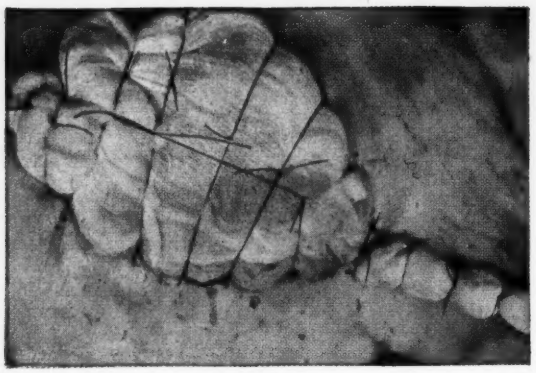

Fig. 540.

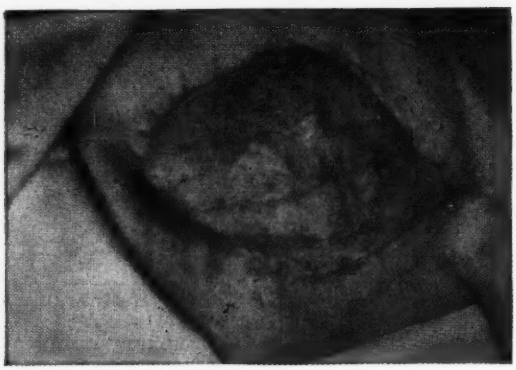

Fig. 541.

FIGS. 537–541.—Series showing wide excision of skin during radical mastectomy for carcinoma of the breast with immediate skin-grafting.

Only 137 of these patients had satisfactory follow-up records because, in a proportion of those who died at home, the exact site of recurrence could not be noted. It will be seen that in 54 patients having a return of the disease during the period 1944–8, there were 32 skin recurrences and 33 recurrences elsewhere (49 per cent). Because of this high incidence of local scar and skin-flap recurrence it was felt that where a radical mastectomy is indicated, wide excision and skin-grafting should be performed more frequently. This applies with equal force in the case treated additionally with pre-operative radiotherapy, but post-operative radiotherapy is not possible because it destroys the grafts.

Thus, in assessing the value of this procedure, we may list the advantages and disadvantages as follows :—

Advantages.—

1. *Increased Rate of Operability.*—Patients in whom there is extensive adherence to skin and fixity of the growth but with manageable lymph-gland metastases will not be denied radical surgery and will be given a no less (and we feel greater) chance of survival.

2. *Improved Prognosis.*—Patients with earlier disease will be given the benefit of a diminished possibility of local scar or skin recurrence.

of operation to the date of discharge has been 23·4 days, with a maximum of 34 days and a minimum of 15 days. It has been found possible to ensure at least a 90 per cent 'take' with split grafts. By contrast, most of us have seen patients in whom the skin is brought together under tension with subsequent necrosis of its edges. Their convalescence is considerably lengthened and is made unpleasant by the painful separation of sloughs, frequent dressings,

Fig. 542.

Fig. 543.

Fig. 544.

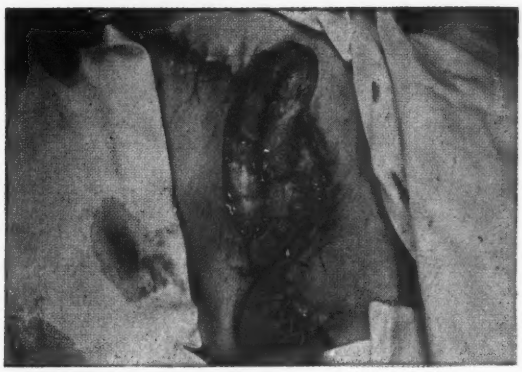

Fig. 545.

Fig. 546.

FIGS. 542–546.—Series showing excision of sloughs and delayed grafting one week after radical mastectomy in which the need for immediate grafting was not recognized.

3. *Avoidance of Sloughing.*—The danger of post-operative wound infection consequent upon tension of the suture line and sloughing of the wound edge is eliminated.

4. *Smooth and Short Convalescence.*—In the last 8 consecutive cases, the average stay from the date

and super-added infection. Indeed, a skin-graft is frequently required at this late stage after the sloughs have separated and in the presence of infection.

5. *Improved Function.*—The freedom of the arm, both immediate and late, is greater where the denuded area is comfortably covered with a graft.

Disadvantage.—

Operating Time is Lengthened.—This may be minimized by having an assistant cut the grafts simultaneously and by the use of an efficient knife or dermatome. With the use of modern anæsthetics, a slight increase in time alone has no ill significance.

Delayed Primary Grafting.—In cases in which the need for a graft has not been recognized at the time of mastectomy, death of the skin edges becomes apparent within a few days. A delayed primary graft can be carried out any time up to the end of the first week. Under anæsthesia, the dead tissue is excised and Thiersch grafts applied. Subsequent healing is quick and sound. The tedium and pain of a long period of separation is thus avoided.

TECHNIQUE OF RADICAL MASTECTOMY WITH IMMEDIATE SKIN-GRAFT

The patient is placed supine on the operating table with the prepared leg externally rotated and the knee flexed (*Fig.* 547). The towels are applied giving access to both breast and thigh. A towel is placed over the skin-graft donor area and a radical mastectomy centred upon the growth, giving a wide excision of at least a 4-in. radius of skin and subcutaneous fat, is commenced. The incision must vary slightly for each individual case, but the same wide skin excision and adequate axillary exposure is secured. With this widened field extensive excision of breast, fasciæ, and muscles is facilitated and dissection of the axilla is simplified.

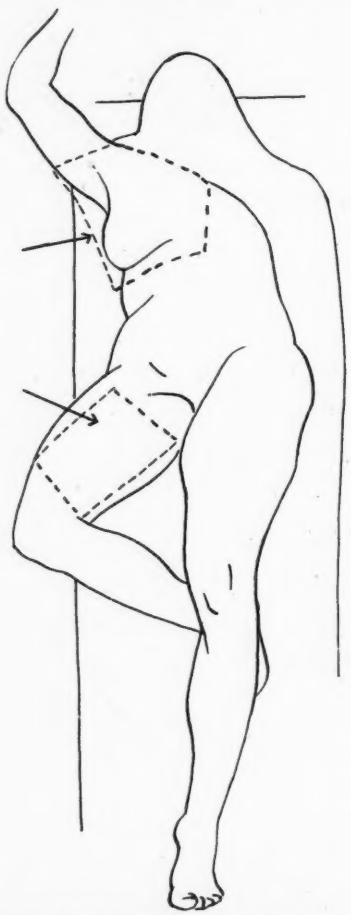

FIG. 547.—Position of patient for immediate skin-graft following radical mastectomy.

When hæmostasis has been secured, the skin-flaps available are used to cover the axilla first. The skin edges to the defect over the chest wall are stitched to the remaining muscular covering, easily and without tension, and the nylon filaments left long to attach the dressings. Two or three drainage tubes are inserted through separate stab incisions to drain from the axilla and from beneath the posterior flap.

Simultaneously, an assistant cuts sufficient Thiersch grafts adequately to clothe the area. It has been found that the Humby knife gives satisfactory grafts of manageable size and even thickness, is simple to operate, and seems extremely suitable for the occasional plastic surgeon.

These grafts are transferred to the denuded area, spread, and stitched both to the edge of the defect and to each other, using continuous or interrupted fine silk. Pressure is maintained and fluid accumulation prevented by a modification of a technique used at the Montreal General Hospital which we have found extremely satisfactory. Wool pledgets soaked in flavine emulsion are gently but firmly 'plastered' on to the grafts, especially into the edge of the defect, and, by the use of a wool compress, firmly held in place. The grafted area is left undisturbed for one week and is then examined. By this technique a 90 per cent 'take' can be ensured.

SUMMARY

It may be generally accepted that the described method should be used in the extensive case to give the patient the best chance, but we feel that the procedure is often justified and indeed indicated in earlier cases also, and that it should be a planned and purposeful procedure, not a means of completing an operation in the case that just won't come together!

Because of the variation of pathological type, site, rate of spread, and stage of the disease at the time of operation, it has been found impossible to present statistical proof of the superiority of this method. The justification for its use, we feel, is two-fold: First, a complete prevention of tension and wound sloughing with neither increased risk to the patient nor lengthened convalescence period; secondly, a diminished possibility of local recurrence.

We would like to express our thanks to Dr. J. S. Fulton, Director of the Liverpool Cancer Control Organization, for access to the records; to Miss B. Duckworth for the illustration; and to Mr. Harold Nevin for the photographs.

ATHLETES' HERNIA OF THE TIBIALIS ANTICUS MUSCLES

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MULTIPLE, small, often symmetrical, herniæ of the tibialis anticus muscles occur fairly frequently in athletes but are rarely recognized. They are usually mistaken for simple varices.

Aetiology.—As these herniæ are usually bilateral and often symmetrical, and as they also occur through well-defined oval defects in the sheath through which, in each instance, a small artery and a larger vein also emerge, it seems likely that they arise through congenital defects in the sheath.

FIG. 548.—Drawing showing the typical appearance of multiple, small, symmetrical herniæ of the tibialis anticus muscles in an athlete.

Persistence of strenuous exertion after the patient's leg muscles are tired seems to be the exciting factor in the majority of cases. In peacetime these herniæ occur most commonly in athletes who run races or who play strenuous games, e.g., 'rugger' forwards, fast bowlers, or 'quarter-milers'. In war-time Kitchin and Richmond (1943) noticed that these herniæ appeared quite commonly amongst commandos undergoing strenuous training on rough and hilly country, and they recall the experience of Hesse (1921) and Pichon (1907), who found these herniæ frequently in alpine soldiers, but rarely in other infantrymen. Ihde (1929) reported 12 cases and noticed that they occurred amongst athletes, soldiers, railwaymen, and foresters. Fère (1900) observed symmetrical herniæ of the tibialis anticus muscles in the legs of epileptic patients.

Symptoms.—The patients complain of an aching pain or a feeling of 'heaviness' or 'tightness' in the legs after prolonged exertion or when they are tired at the end of the day. Sometimes they have noticed that small swellings appear on the front of the legs when weight is borne on them. Many

FIG. 549.—Drawing showing hernial protrusions through the anterior muscle-sheath of the leg.

patients state that these swellings have been treated as varicose veins and injected.

Signs.—On relaxation of the tibialis anticus muscles one or more small symmetrical, rounded swellings appear in the middle third of the outer side of the anterior aspect of each leg. The swellings can be seen most easily when the patient takes up the 'lunge position' like a fencer (Pichon, 1907), or the more exaggerated position of a runner at the start of a race. The essential elements of this 'test position' are that the body-weight should be borne on the leg under examination and that the hip, knee, and ankle should all be flexed. The swellings

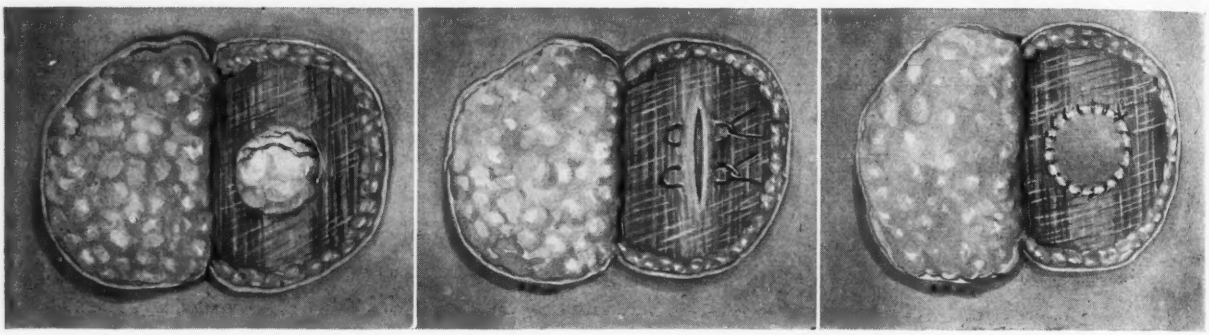
appear also on passive plantar flexion of the foot and disappear on active contraction of the tibialis anticus, i.e., on active dorsiflexion of the foot and toes.

An enlarged vein can often be seen passing upwards and inwards across the shin from the region of each swelling. Varicose veins in other parts of the legs are often present as well.

On palpation the tumours are felt to be soft and easily reducible. At the base of each, a defect in the tibialis anticus muscle-sheath can be felt. These defects vary from ¼ in. to 1 in. in diameter, are rounded or oval in shape, and their margins are well-defined (*Figs.* 548, 549).

been repaired, the Esmarch's bandage is removed so that hæmostasis can be secured before the skin sutures are inserted. A pressure dressing consisting of tulle gras, wool soaked in paraffin and flavine emulsion, gauze, wool, and crêpe bandages is applied and the legs and feet are immobilized by a plaster-of-Paris slab.

After-treatment: The patient remains in bed two weeks, and during the first month after he starts walking about the legs are supported by firm crêpe bandages. Three to six months later strenuous exertion can be resumed after a period of carefully graduated muscle training.



A B C

FIG. 550.—Drawings showing the stages of operative repair: A, Semilunar skin incision exposing hernial defect and showing the pad of fat with vein and artery emerging through the ring defect in the anterior sheath of the tibialis anticus muscle. B, Repair of a small defect by direct lateral mattress sutures of Pagenstecher's linen thread. C, Fascia lata patch for repair of a large defect.

Treatment.—

1. *Conservative.*—If the patient wears elastic stockings or crêpe bandages when walking about, and if strenuous exertion is avoided, the aching pain will be relieved. If, however, the patient is anxious, as he often is, to resume his profession as an athlete or his favourite pastime, operative repair of the herniæ is indicated.

2. *Operative.*—Small defects can be repaired by direct lateral suture, using fine, but strong, silk or Pagenstecher's linen thread for interrupted mattress stitches. In the larger defects, where this procedure would be associated with undue tension, fascia lata 'patch grafts' are preferable.

Operation: Under general anæsthesia Esmarch's bandages are used to exsanguinate the leg and lower half of each thigh. Semilunar incisions are made to expose each hernial defect. The fascial sheath around each defect is exposed and the edges of the defect carefully defined. A pad of soft, yellow fat protrudes in front of the muscle and a vein and a small artery emerge through the defect (*Fig.* 550 A). In some, a small subcutaneous branch of the musculocutaneous nerve also escapes through the sheath at this point. Small defects are closed by interrupted lateral mattress sutures of fine silk or Pagenstecher's linen thread (*Fig.* 550 B). When dealing with the larger defects, fascia lata is removed from the lower third of one thigh and cut into suitable patches for each defect (*Fig.* 550 C). The donor area is repaired by continuous blanket or mattress sutures of silk. Each fascial patch is sutured so that it is stretched gently over the defect (*Fig.* 551). After the herniæ and donor area have

RECORDS OF FIVE RECENT CASES

Case 1.—A. C., a rugby football forward, aged 17, complained of aching pain in the legs towards the end of a hard game and the appearance of small lumps over the middle thirds of each leg.

On examination, the patient was fit, athletic, and muscular. There were three rounded soft swellings in symmetrical positions over the middle third of each tibialis anticus. The swellings became larger when weight was borne on the leg which was under examination, and when the tibialis anticus was relaxed and the foot was allowed to hang loosely in plantar flexion. On active contraction of the tibialis anticus the swellings became much smaller. A defect in the sheath, varying from ½ in. to ¾ in. in diameter, could be felt beneath each swelling.

OPERATION (Aug. 19, 1946).—Under general anæsthesia, after exsanguination of each leg with Esmarch's bandages, the defects were repaired by direct suture, using interrupted lateral mattress stitches of fine Pagenstecher's linen thread. The skin was sutured and the dressing applied before the Esmarch's bandages were removed. This was a technical error and resulted in hæmatoma formation on the right side and this was associated with a transient foot-drop. Despite this set-back, the final result was satisfactory, the swelling and pain soon disappeared, and the patient is now in the army and is able to play rugby football without discomfort.

Case 2.—J. A. M., a fast bowler, aged 23, had noticed aching pain after exertion in each leg for five years. He had also noticed that small round swellings appeared on his legs periodically. These had been treated as varicose veins and injected without benefit.

On examination there was one soft, rounded, bluish swelling, ¾ in. in diameter, over the middle third of the right tibialis anticus and two similar but smaller swellings, ¼ in. in diameter, in a corresponding position on the

left side. A well-defined defect in the sheath could be felt beneath each swelling and, on active contraction of the muscles, the swellings disappeared.

OPERATION (Aug. 12, 1946).—The three herniæ were repaired by fascia lata ' patch grafts ', which were sutured over each defect with Pagenstecher's thread.

Progress was uneventful. The patient is now symptom-free and able to play cricket without discomfort.

Case 3.—D. I., an athletic girl aged 19. The patient had been a member of a running team for the last few years, and during the previous year had noticed a ' heavy

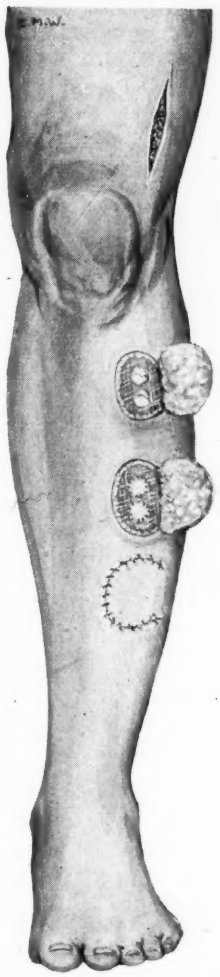


FIG. 551.—Drawing showing the various stages in the repair of large defects of the anterior sheath by fascia lata ' patch graft '.

feeling ' or sometimes severe aching pain in her legs when tired. During the last few months she had noticed small swellings on her legs when she was walking.

On examination, small, soft, symmetrical swellings were visible over the middle third of each tibialis anticus muscle. These swellings disappeared on active contraction of the muscles and were more prominent when the patient bore her weight on one lower extremity, the knee and hip of which were flexed. A defect in the sheath about $\frac{1}{2}$ in. in diameter was palpable beneath each swelling.

OPERATION (Feb. 4, 1948).—The hernial defects were repaired by direct lateral mattress sutures of Pagenstecher's thread.

The swellings have now disappeared and the aching pain has gone.

Case 4.—M. S., a rugby fotballer aged 21. About one year previously the patient had noticed aching pain and a swelling in the middle third of the outer side of the right leg. He had been under treatment for ' phlebitis ' and injection treatment had been given.

On examination there was a small, rounded, soft swelling at the junction of the middle and lower thirds of the outer side of the right leg about $\frac{3}{4}$ in. in diameter. A defect in the muscle sheath was palpable beneath the hernial swelling.

OPERATION (Feb. 27, 1948).—A fairly large defect was found in the right tibialis anticus muscle-sheath, and through this, besides a pad of yellow fat and muscle, a cutaneous branch of the musculocutaneous nerve and a small artery and vein also emerged. A fascia lata patch was sutured over the defect in the sheath.

Progress was satisfactory and the swelling and aching pain disappeared.

Case 5.—M. J. S., male aged 63, had for many years been used to hill climbing and taking long walks as a pastime, not always when physically fit. During the previous ten years he had noticed a small rounded swelling on the outer side of the left leg. This had caused no discomfort nor disability and was considered to be due to a varicose vein.

On examination there was a visible, rounded, bluish swelling situated over the anterior aspect of the muscle belly of the tibialis anticus at the junction of the upper and middle thirds of the left leg. This swelling became more prominent when weight was borne on the leg and when the knee and the hip were flexed. It measured 2 cm. from above downwards and 1·5 cm. in transverse diameter: when the tibialis anticus was actively contracted it disappeared. On palpation the swelling was soft and a defect could be felt in the muscular sheath beneath it.

On the right side, at a slightly lower level, that is half-way between the knee and the ankle, a similar but smaller rounded swelling was present over the anterior aspect of the tibialis anticus muscle. This swelling measured 1 cm. in its vertical and horizontal axes; a defect in the sheath could be felt beneath it.

As these swellings caused no disability, no treatment was required.

DISCUSSION

There appear to be two types of hernia through the anterior sheath of the tibialis anticus muscle.

The rarer type, described by Ihde (1929) as " traumatic ", has been fully described in most text-books and is the result of direct trauma. A single severe blow on the contracted muscle (Hartzell, 1936), or a stab wound, causes a local tear in the sheath and later a single, often rather large, hernia develops. If this causes disability the hernia should be repaired by a fascia lata graft. In the more common type the herniæ are multiple and symmetrical, corresponding to the " distension herniæ " of Ihde (1929), and are probably congenital in origin. These are not often recognized and are not described in the standard text-books. They arise probably in much the same way as oblique inguinal herniæ, but through congenital defects in the tibialis anticus sheath, through which small veins, arteries, or cutaneous nerves normally emerge from the deep muscular compartment. In each of our first four cases a vein and artery, and in one case also a small cutaneous nerve, were seen to emerge with the muscular hernia through a well-defined ring in the anterior sheath. The symmetrical distribution of these multiple herniæ also supports the theory of

congenital ring defects. Herniation does not occur until repeated strains have been imposed and the commonest type of strain seems to be the maintenance of strenuous exertion of the leg muscles after they are tired. The muscles swell and burst through the congenitally weak areas.

In practice this seems to happen most frequently in runners and soldiers under training in mountain warfare. Swelling of the muscles in the deep fascial compartment may also obstruct the deep veins and give rise to varicosity of the superficial veins, and it has been noted that varicose veins are associated with the herniæ in many cases.

Ten dissections on post-mortem specimens have been made and the usual sites of emergence of the arteries, veins, and nerves through the anterior sheath appear to correspond to the common sites of the symmetrical herniæ and correspond also to the sites mentioned by Ihde (1929).

SUMMARY

1. There seem to be two types of tibialis anticus hernia.

2. The rarer type is due to a single, direct trauma which causes tearing of the sheath and a single large hernia.

3. The commoner type probably occurs through congenitally weak areas in the sheath, i.e., through the rings through which small arteries, veins, or cutaneous nerves normally emerge. Repeated leg strain after the muscles are tired appears to be the usual exciting factor and this occurs most often in athletes and alpine soldiers. These herniæ are multiple, small, and often symmetrical.

4. *Treatment.* Rest and support with elastic stockings or crêpe bandages relieve the symptoms, but if the patient is anxious to continue his strenuous exertions, repair by direct suture of the smaller defects and fascia lata ' patch grafts ' for the larger defects is indicated.

5. Brief notes are given of five recent cases. In four of these there were multiple almost symmetrical herniæ ; in one case only a single hernia was found. These cases are compared with others previously reported.

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TRICHOBEZOAR

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THE knowledge of the occurrence of hair balls and other foreign bodies in the stomach of animals is one of considerable antiquity. The first authentic record of a trichobezoar in man is by Baudamant (1779), and for a time subsequent accounts consisted mainly in post-mortem observations. Steltzner (1896) was the first to publish details of a trichobezoar removed at operation. DeBakey and Ochsner (1938, 1939), in a comprehensive review, were able to collect 171 cases of trichobezoar from the world literature, and to that they added 1 case of their own. Since then further examples of trichobezoar have been recorded by Webster (1938), Rodriguez Castro (1938), Gabstyan (1939), Butters (1939), Nemec (1940), Sumney and Borzel (1941), Lear and Brady (1943), Batygina (1944), Gräberger (1944), Miller and Kert (1944), Sarnoffs (1945), and Parsons (1947). Miller and Kert (1944) cite 3 cases, thus making the total number 186.

Trichobezoars, which may consist of several hair balls joined together by faceted surfaces, usually assume a J-shaped form, often giving a perfect cast of the stomach. At times they extend into the duodenum, or more rarely into the œsophagus. The largest ever reported was one by Davies (1921) which weighed 6½ lb. immediately after removal, but, in view of the considerable loss of weight which occurs with drying, the record is probably held by Russell (1869), whose trichobezoar weighed 4 lb. 7 oz. when dry. DeBakey and Ochsner (1938) consider their own example of 1·6 lb. (750 g.) to be of average weight. The surface of the trichobezoar is usually covered by glairy, slimy mucoid substance, and mixed with the hair there are often particles of food and especially of fat, the latter being little digested by gastric juice. Occasionally there is a mixture of hairs from other animals, bits of cotton-wool, string, bristles, and vegetable fibres. No matter what the colour of the patient's hair, the hair ball tends to assume a dark greenish-brown or black tint, probably due to the action of gastric juice or to the presence of sulphide in ingested food, and because of decomposing particles its odour may be very unpleasant. It is thought that the stomach is normally unable to expel hairs, especially if they are swallowed apart from food, and so their continued ingestion leads eventually to the formation of a ball. Over 80 per cent of trichobezoars occur before the age of 30, the majority in the second and third decades of life, and well over 90 per cent have been noted in women, probably because hair in girls is liable to be long, and a hair-biting habit often begins early in life. DeBakey and Ochsner (1938) record the incidence of psychic and mental disturbances among affected patients as almost 14 per cent, but probably the proportion of mental instability is greater than that, and often the trichophagia may persist after an operation and may lead to the necessity for further surgical relief.

In the early stages there may be no symptoms. Later, vague gastro-intestinal disturbances predominate, the patient exhibiting anorexia, dyspepsia,

malaise, weakness, loss of weight, and a feeling of oppression in the epigastrium. Later still nausea and vomiting may develop, and the patient may experience epigastric pain, often paroxysmal in character. At that stage constipation frequently alternates with diarrhœa. A small trichobezoar or a piece breaking away from a larger tumour may pass into the bowel and give rise to intestinal obstruction. The final picture presented may also be due to ulceration of the stomach, perforation, or peritonitis, and occasionally the patient may succumb to inanition due to sheer size of the tumour. By the

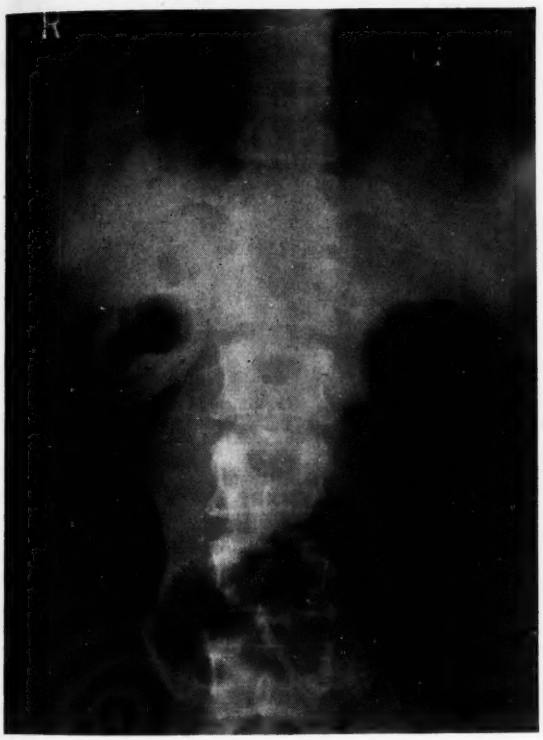

FIG. 552.—Radiograph showing the low position of the splenic flexure, and the shadow of the tumour in the stomach.

time a case of trichobezoar comes to notice a palpable abdominal mass, extending from one hypochondrium to the other, is present in almost 90 per cent of cases. This mass is usually J-shaped, well defined, smooth, uniformly firm, and very mobile. On three previous occasions (Harvie, 1908; Moore, 1914; and Miller and Kert, 1944) crepitus was elicited by palpation. The patients often reveal a degree of hypochromic anæmia. Their test-meal is either normal or shows low acid and may often contain debris, including hair. Examination of the stools may show the presence of hairs. Barium or insufflation of air is very useful in the diagnosis of bezoars by means of X rays, and gastroscopy would probably be helpful. The treatment is surgical, and operative mortality in uncomplicated cases is low.

CASE REPORT

R. B., now aged 40, was treated at hospital both as an in- and out-patient from 1941 to 1944 because of recurrent diarrhœa, loss of weight, and moderate hypochromic anæmia. She used to complain of discomfort in the left iliac fossa and occasionally referred this to the epigastrium. She always gave one the impression of being rather furtive and reserved to a pathological degree. Examination at the time revealed no tumour or localized tenderness and investigations showed a low acid curve in the fractional test-meal, no gross abnormality in the colon, and slight excess of fat in the stools. She improved with bowel sedatives, iron, and blood transfusion and was then lost sight of from January, 1944, till Sept. 27, 1947, when she was readmitted with the following history :—

She continued to pass every day about five or six watery slimy motions, some containing traces of blood. For two weeks before admission she had spasms of pain in the upper abdomen, radiating into the chest and more marked when she lay down at night. This pain, often accompanied by vomiting, was apparently griping and colicky in character and eventually, a few days before admission, she had to take to bed.

FIG. 553.—The trichobezoar after removal.

Clinical examination revealed the same pallor which she had shown on previous occasions, flattening of the nails, and abdominal distension. The distension was found to be due to a large sausage-shaped tumour running from beneath the left costal margin towards the right hypochondrium, which gave the impression that it was displacing the left leaf of the diaphragm in an upward direction. The lump felt hard and crepitant, giving one a feeling similar to that encountered in subcutaneous emphysema. The lower abdomen was slightly distended. The patient was observed for a few days and though the tumour seemed to vary in size and slightly in shape, these variations could really be explained by the mobility of the mass, which would hide to a greater or lesser extent beneath the lower part of the thoracic cage. Because the patient was passing several motions a day it was tempting to connect her present trouble with the past manifestations, and because she was vomiting profusely it was thought that she was suffering from some form of incomplete intestinal obstruction. She had a plain radiograph of the abdomen and this showed clearly the gas pattern of the large intestine. The position of the splenic flexure appeared abnormally low, as if it were displaced by some mass between it and the left leaf of the diaphragm. At that time the significance of

a shadow seen in that region was not appreciated, but a definite opacity of uneven density could be discerned outlining clearly the contours of the stomach filled with the tumour (*Fig.* 552).

The patient was operated on by one of us (A. R. L.) on Oct. 6, and through a left paramedian incision the anterior surface of the stomach was incised in its long axis for 4 in. A trichobezoar was then delivered and found to form a complete cast of the stomach. A small wisp was also projecting into the duodenum. The maximum length of the tumour was 11 in. and the diameter 3 in., and in its fresh state it weighed just under 3 lb.* (*Fig.* 553). The colour of the trichobezoar corresponded to that previously described, but it had no offensive odour. The peritoneal surfaces of the colon and small bowel were inspected and these seemed normal. The liver was studded with numerous whitish areas the size of a pin's head and a biopsy revealed that these represented areas of periportal fatty infiltration. Following the operation she was given a transfusion of two pints of blood and proceeded to make an uneventful recovery.

The patient, whose hair was seen to be no longer than about an inch in most places, was subsequently questioned, but denied eating her hair, though she admitted to having eaten coal. The mother recalled often seeing her daughter pulling her hair down and biting it, and, when told of the operation finding, added: "Well, now that explains why the brushes have all been losing their bristles". The patient herself never admitted to any indigestion, though the stomach was almost completely filled with the tumour. When discharged from hospital her weight was only 5 st. 13¼ lb., but when seen in out-patients on May 27, 1948, it had gone up to 7 st. 8 lb., and she no longer complained of diarrhœa. It was also noticed that her hair had grown to reasonable length.

DISCUSSION

In retrospect it seems fairly certain that all the early manifestations in this case case were, in fact, due to the trichobezoar, which originally was not large enough for clinical recognition. Diarrhœa has often been noted by others as a manifestation of the condition, and it is interesting to reflect that in spite of the size of the tumour the patient managed to strike a precarious balance till the later stages when vomiting brought the matter to a climax. The changes in the liver, not previously noted by others, suggest, however, fairly severe nutritional deficiency of some standing. The crepitus in this case is worth underlining because it left one with the impression that, if looked for, it would be found more frequently in such cases and thus be of considerable diagnostic help.

SUMMARY

1. A case of trichobezoar simulating 'colitis' is described.

2. The literature on the subject is briefly reviewed.

* The specimen is now in the Pathological Collection, Museum of the Royal College of Surgeons.

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MEDIASTINAL CYSTS OF GASTRIC ORIGIN†

REPORT OF A CASE

BY B. J. BICKFORD

FROM THE LIVERPOOL CHEST SURGICAL CENTRE

THE rarity of cases of gastric or enteric cysts in the mediastinum seems to warrant publication of a report of a further case.

CASE REPORT

David C., aged 3 years 3 months, was admitted to the Liverpool Chest Surgical Centre, Broadgreen Hospital, on Sept. 3, 1946. His mother gave the history that he had never been really well since birth, and that he had suffered from chest symptoms from the age of 9 months. He had been in hospital with "bronchopneumonia" at the age of 11 months, and again at 30 months. Ever since the first of these illnesses he had been subject to recurrent periods of increased cough with dyspnœa, lasting for two or three days, and coming on at intervals of about six weeks. The last attack took place ten days before admission and was the worst he had had. In it he had been very dyspnœic and somewhat cyanosed, and his doctor noted that when he sat up his dyspnœa and cyanosis became worse. A radiograph of the chest revealed an abnormal shadow; admission to hospital was therefore advised.

ON ADMISSION.—He appeared to be quite a healthy boy, though somewhat underweight (28 lb.). The only abnormal physical signs found were diminished

† Being the substance of a communication read at the Meeting of the Society of Thoracic Surgeons, Nov. 13, 1947.

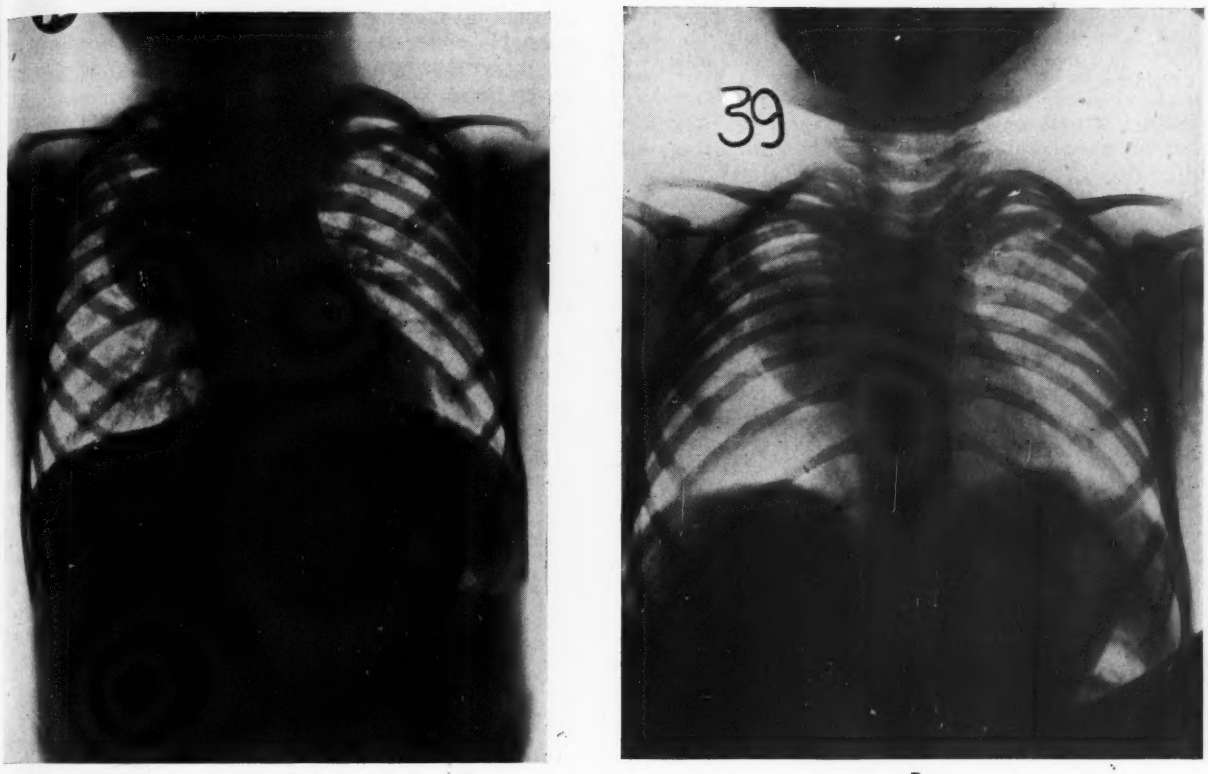

FIG. 554.—Radiographs showing: A, The rounded shadow on the right side of the mediastinum; and B, The changes in the thoracic vertebræ and the asymmetry of the ribs.

movement and dullness of the upper part of the right side of the chest, with diminished air entry and a few râles in the right upper lobe. Radiographs of the chest (*Figs.* 554, 555) showed a rounded shadow in the right posterior mediastinum and a complicated congenital abnormality of his upper thoracic vertebræ and ribs. This involved the vertebræ from the 3rd to the 8th, with changes ranging from hemivertebræ to spina bifida. There were 12 ribs on the right side, but only 11 on the left.

It was difficult to arrive at a diagnosis; the most probable was thought to be ganglioneuroma, particularly as this is sometimes associated with other congenital defects. During three weeks' observation in hospital he had no further dyspnœic episodes, but in view of the history of repeated attacks of increasing severity, it was decided to explore the chest.

AT OPERATION.—A right thoracotomy was performed by Mr. F. Ronald Edwards on Sept. 26, 1946. The mediastinal tumour was about 4 cm. in diameter, and was adherent to the sides of the vertebral bodies in the right posterior mediastinum. It was at first thought to be solid, but it proved to be a very tense cyst which burst during removal. The fluid which escaped appeared to contain brown altered blood and a number of shiny crystals, probably cholesterol.

The child stood the operation well and made an uninterrupted recovery, being discharged home on the twenty-fourth post-operative day.

MICROSCOPICAL EXAMINATION OF THE CYST WALL.—Dr. F. Whitwell reported that it consisted of two layers of smooth muscle, running in different directions, just as in the intestine. The lining was largely composed of granulation tissue, but in one thickened area there was mucous membrane similar to that of the cardiac end of the stomach. At the edge of the mucous membrane was an area of typical chronic peptic ulceration (*Figs.* 556–559).

FIG. 555.—Lateral radiograph of the chest, showing the position of the cyst in the posterior mediastinum.

Judging from the brown colour of the fluid there had been hæmorrhages into the cyst, and no doubt these had been responsible for the repeated attacks of dyspnœa.

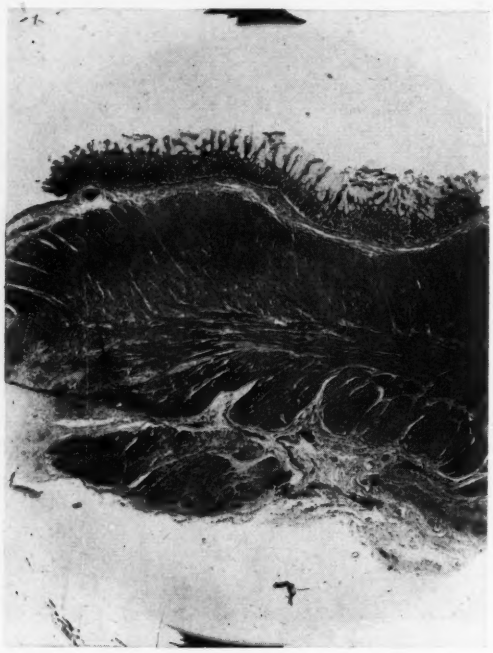

FIG. 556.—Microphotograph of cyst wall, showing mucosa and muscle coats. (× 11.)

FIG. 557.—Microphotograph of cyst wall, showing edge of chronic peptic ulcer. (× 24.)

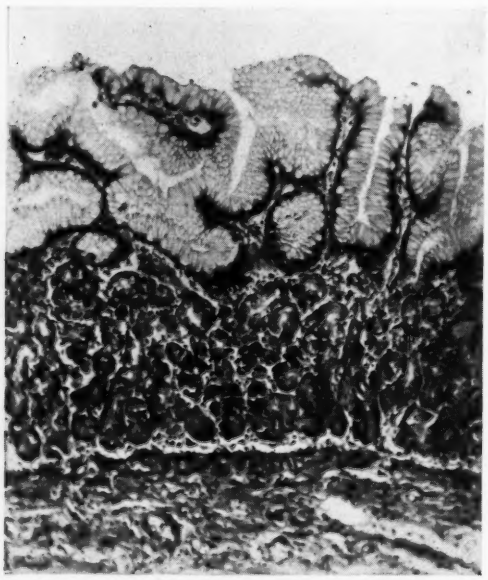

FIG. 558.—Microphotograph of cyst wall, showing gastric mucosa. (× 88.)

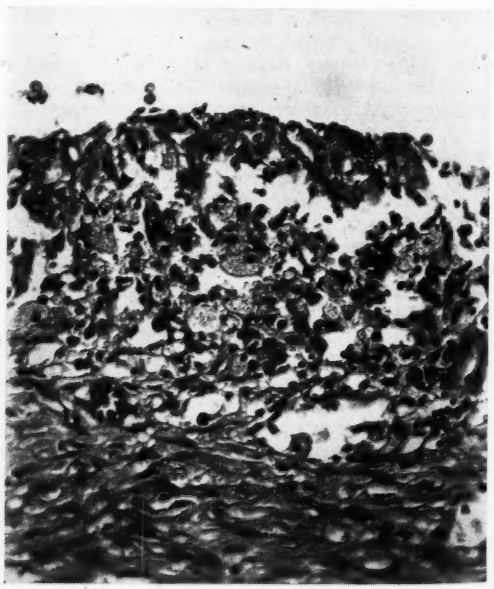

FIG. 559.—Microphotograph of cyst wall, showing typical area of granulation tissue lining. (× 225.)

DISCUSSION

Cysts of the posterior mediastinum have been reported with increasing frequency during recent years, but they remain, nevertheless, uncommon. They are almost entirely associated with anomalous development of the primitive foregut and of the structures derived therefrom. They are lined with epithelium such as is found in the trachea, œsophagus, stomach, or small intestine, and the wall of the cysts of alimentary type usually contains two, or sometimes three, layers of smooth muscle.

The mode of origin of enterogenous cysts of the thorax is not known. Schwarz and Williams (1942) suggest that a supernumerary ' bud ', similar to the lung-bud, may be formed in the lower part of the œsophagus, and that such a bud might develop into gastric or intestinal tissue under the influence of embryonic organizer substances in the vicinity.

Ladd and Scott (1944) regard them as being essentially duplications of the foregut, due to partial failure of coalescence of vacuoles in the primitive alimentary tract during the process of canalization. Two of the cases reported by the latter authors had cysts closely adherent to and sharing a common muscular coat with the œsophagus. Such a close association with the œsophagus is, however, distinctly unusual.

It has also been suggested that these cysts may be connected with the vitello-intestinal duct, but there is no very convincing evidence to support this view.

Until more is known about the normal mechanisms of development it is hardly possible to do more than speculate about their aberrations. It does appear probable that mediastinal enterogenous cysts arise from the foregut at about the fourth week of intra-uterine life through some abnormality of organizer activity. This offers a ready explanation of the presence of œsophageal, gastric, or intestinal mucosa in the thorax, as Schwarz and Williams (1942) have shown. But from the great rarity of congenital diverticula of the œsophagus one may surmise that the origin of these cysts lies more in defective canalization, as suggested by Ladd and Scott (1944), than in the formation of an accessory bud. On the other hand the supposition of the formation of a bud on the anterior aspect of the œsophagus offers, with the rotation of the alimentary tract at a later period, a possible explanation of the observed fact that these cysts are much more common on the right side than on the left.

These cysts are not infrequently accompanied by congenital defects of other regions, particularly of the vertebral column (as in this case), and sometimes by cysts in association with other parts of the alimentary tract.

The diversity of the histology of mediastinal enterogenous cysts is worthy of note. Olenik and Tandatnick (1946) state that 12 cysts lined by primitive œsophageal epithelium have been reported. Including cases summarized in their paper and their personal case, it appears that 39 cases of mediastinal enterogenous cyst have now been reported (Schwarz and Williams, 1942; Ward and Krahl, 1942; Steele and Schmitz, 1945; Kinsella, 1945; Valle and White, 1946; Davidson and Brown, 1947; Lindquist and Wulff, 1947; Davis and Salkin, 1947; and Christoffersen, 1947). Of these 23 were purely gastric in type, 4 purely intestinal, and 12 were composite, containing elements from different parts of the alimentary tract, or with the addition of areas of respiratory mucosa.

The present case appears to be the twenty-fourth purely gastric cyst to be recorded.

Most enterogenous cysts have been found in children, and they are generally incompatible with long survival. Only one case is known to have reached adult life (Schwarz and Williams, 1942), and one other was 15 years of age (Steele and Schmitz, 1945); the remainder experienced symptoms during the first six years and many during the first months of life.

The group of cases in which gastric mucosa lines the cyst is of particular importance, for functional activity is often retained and peptic ulceration is liable to occur in the wall of the cyst. Such an ulcer may perforate into the pleura or lung, or it may erode a large blood-vessel or the vertebral column. As a result many cases present a bizarre clinical picture, perhaps with a pyopneumothorax or with infective changes in the lung, and often with repeated hæmoptyses. In some of the complicated cases surgical excision is not possible; in the majority of cases, however, removal of the cyst by thoracotomy is a practicable procedure. The early age of the patient is not necessarily a bar to surgery, for with modern methods of anæsthesia even very young children stand operation well. The ideal treatment is therefore thoracotomy as early as possible, with a view to excision of the cyst. The operation may present many difficulties, as the cyst is often densely adherent to important structures in the mediastinum. In this connexion Ladd and Scott (1944) warn of the dangers of separation of a cyst from the œsophagus, and recommend marsupialization and later obliteration of the track rather than one-stage excision when connexion of the cyst to the œsophagus is intimate.

Naturally the diagnosis presents many difficulties. Early thoracotomy should be advised in the presence of a rounded posterior mediastinal shadow; thus it may be practicable to remove a gastric cyst before the onset of serious complications. The possibility of the presence of a gastric cyst should be borne in mind when dealing with an obscure and complex thoracic clinical picture in childhood. The occurrence of repeated attacks of dyspnœa and cyanosis, of hæmoptyses, or of a pyopneumothorax without obvious cause are suggestive features.

I wish to thank Mr. F. Ronald Edwards, under whose care this patient was, for permission to publish details of this case and for his help in the preparation of this paper.

I am also indebted to Dr. F. Whitwell for his report on the histology of the specimen, and for allowing me to reproduce his excellent microphotographs.

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OBSERVATIONS ON BONE LESIONS IN HODGKIN'S DISEASE

By P. J. MOIR and J. G. BROCKIS, Leeds

Lesions in bones occur not infrequently in lymphadenoma (Hodgkin's disease). There is an extensive literature on the subject, but the scarcity of reference to the condition in the standard textbooks of surgery is noteworthy. The case reported below illustrates a very extensive involvement of the skull together with a small focus of disease in the left femur. Massive involvement of the inguinal glands was present and these had broken down and ulcerated through the skin.

Figs. 560, 561.—Soft-tissue swelling overlying skull lesion.

CASE REPORT

The patient was a boy aged 16. Swellings in the groins were first noticed in October, 1944. Two years later the swellings became tender and inflamed, the skin broke down, and there was discharge and hæmorrhage. He was admitted to a hospital in October, 1946, where the condition was regarded as tuberculous, with secondary infection from the skin. A radiograph of the chest showed no evidence of disease. Three weeks later (November, 1946) he was admitted to the Middleton-in-Wharfedale Sanatorium. In January, 1947, he was seen by one of us (P. J. M.) in consultation with the Medical Superintendent, Dr. Raeburn. The inguinal glands were enlarged, some had softened and broken down and were discharging through the skin. Two soft fluctuating swellings in the fronto-parietal region of the skull were noted. Some of the material from the groin had been scraped away and the swelling in the scalp aspirated.

These specimens had been submitted to Dr. Orr, who reported upon them as follows: "The material from the groin consists of ulcerated squamous epithelium (skin). The remainder is granulation tissue in which large Hodgkin-type cells predominate. There are also many nucleated cells usually found in Hodgkin's disease. Scattered throughout can be seen remnants of lymphatic tissue. The material aspirated from the scalp was sterile on culture and no tubercle bacilli were found. A gland that had been excised from the neck was typical of Hodgkin's disease."

We are indebted to Professor M. J. Stewart for a second opinion on the material. He reports as follows: "The glandular lesion is an extraordinary one. It is not the ordinary picture of Hodgkin's disease, but is, I think, a variant of the same. In the cervical gland biopsy the lesion is virtually limited to the lymph paths, which are full of proliferated littoral cells (sinusoidal reticulum cells) with many giant cells of the Hodgkin type, and also a few very large multinucleated cells rather of the Langerhans type like those seen in tubercle. There is also some focal necrosis in places, but the picture does not suggest tubercle otherwise. More sections were cut and stained by Ziehl-Neelsen's method with negative results. Eosinophilia is abundant along the lymph paths and a very striking feature is the sharp line of junction between the lymphoid follicles and these catarrhal or hyperplastic lymph paths."

Fig. 562.—Ulceration in groin lesion.

The patient was transferred to the Infirmary at Leeds.

On Examination.—The general condition of the patient was good. Temperature and pulse were normal.

No abnormality was found in the vascular or respiratory systems. On abdominal examination no enlargement of the spleen was detected. The Wassermann reaction was negative.

Over the fronto-parietal region of the skull on the right side were two swellings, one 4 in. by 3 in. and the other slightly smaller and posterior to the first. These swellings were soft, fluctuant, and slightly tender, with rather ill-defined edges but without any inflammatory redness of the overlying skin (*Figs.* 560, 561).

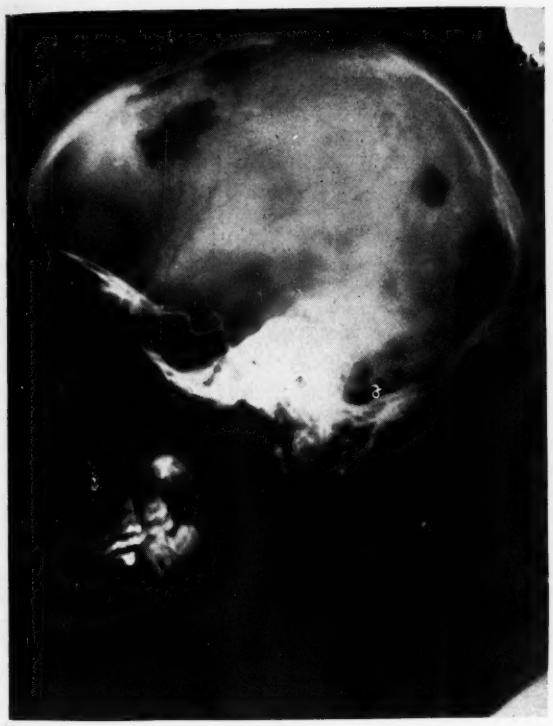

FIG. 563.—Punched out areas in skull—lateral view.

In the right groin was a mass of soft matted glands and an area of ulceration, from which came a considerable amount of discharge. In the left groin a similar condition existed and there were two areas of ulceration and sinus formation (*Fig.* 562).

In the neck on the right side was the scar of the earlier biopsy operation and several small discrete glands could be felt in both posterior triangles of the neck. In the axillæ there were a number of enlarged lymph-nodes.

Radiographs of the skull (*Figs.* 563, 564) show bone destruction with punched-out areas and little surrounding sclerosis. *Fig.* 565 illustrates a small focus of disease in the left femur at the junction of the head and neck. The spine, pelvis, the right femur, the tibiæ, and the clavicles and ribs were X-rayed but no radiological evidence of further lesions was demonstrable.

Blood Examination.—R.B.C. 4,700,000; W.B.C. 11,000; Hæmoglobin 90 per cent; Colour index 0·9.

Differential Count: Eosinophils 1 per cent, Neutrophils 66 per cent, Lymphocytes 13 per cent, Monocytes 8 per cent, Bands 12 per cent.

DISCUSSION

There are three noteworthy features in this case: (1) Breaking down of glands in Hodgkin's disease and ulceration through the skin. (2) Destructive lesions in the skull and femur. (3) The association of fluctuant swellings with the lesions in the skull.

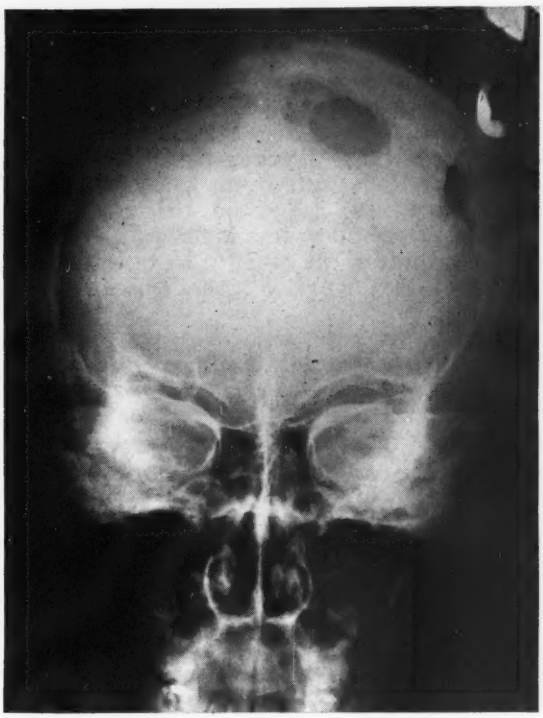

FIG. 564.—Anteroposterior view of skull, showing bone destruction.

1. It was at one time denied that skin involvement could occur as a result of direct infiltration from underlying lymphatic glands. Authorities followed Ewing's dictum that tuberculosis follows

FIG. 565.—Small focus of bone destruction in neck of left femur.

Hodgkin's disease like a shadow, and this was therefore thought to explain all these cases. H. N. Cole (1917) described two cutaneous types of the disease. In the one the lesions were secondary to the underlying glands and in the other were due to a primary infiltration of the skin with lymphadenomatous tissue. Since 1917 many other cases have been reported.

In the case we report the glandular involvement in both groins was considerable. The glands were obviously broken down and in areas soft and semi-fluctuant. In both groins ulceration was present. It would seem to be obvious that the skin involvement was the result of direct spread from the underlying glands. Nodes present in the axillæ were discrete and had not broken down. Deep X-ray therapy was dramatic in the rapidity with which it caused the glands of the groin to retrogress and the skin to heal. Efforts to find tubercle bacilli in these lesions failed.

2. Lesions of bone in Hodgkin's disease are commoner than is generally realized.

Steiner (1943), in his general review of bone-marrow lesions in Hodgkin's disease, points out that osseous lesions were first described by Benda in 1904, although changes which were possibly examples of this disease had previously been presented by Hammer in 1894.

Steiner adds that the uncertainty about these earlier cases was due to the absence of a clear-cut histological description of the disease. In 1920 Askanazy wrote the first paper dealing exclusively with the osseous lesions from the point of view of pathology. This was followed in 1922 by Grossmann, who wrote on the radiological features.

Dresser (1926) reviewed Hodgkin's disease and allied conditions of bone; he reported 96 cases, finding bone involvement in 4·4 per cent. Since that time Craver and Copeland (1934) have reported a series of cases showing bone lesions in 15·7 per cent and Uehlinger (1933) in 30 per cent. The higher figures come from series investigated at autopsy, and radiological data give the lower percentage. This indicated that a number of lesions cannot be visualized radiologically. In 1936 Dresser and Spencer reviewed a further 66 cases in which 120 bone lesions were found. The following facts were ascertained: the age range extended from 11 years to 68 years, the commoner age group was the third to fourth decade and the sex incidence was roughly equal.

The lesions were distributed as follows: Spine 29, pelvis 23, femur 19, skull 11, ribs 11, sternum 9, clavicle 4, tibia 4, humerus 4, scapula 3, calcaneum 1, radius 1, maxilla 1. It will be noted that their distribution is found to correspond with that of the red marrow (Uehlinger, 1933).

Radiologically the appearances simulate metastatic malignant disease, multiple myeloma, osteogenic sarcoma, bone cyst, or osteomyelitis.

Generally, the appearances are those of destructive lesions. This is particularly noted in the skull and pelvic bones, where punched-out areas are demonstrated. They resemble multiple myeloma. This is not surprising, as plasmacytoma, reticulum-cell sarcoma, and Hodgkin's disease are near relations and there is indeed no clear-cut dividing line histologically between reticular-cell sarcoma and the more malignant varieties of Hodgkin's disease. Stewart, Armstrong, and Faulds (1946) published radiographs of a case of multiple myeloma with almost identical appearances to those seen in our case.

In the long bones the lesions occur typically at the ends, though cases with mid-shaft involvement have been reported. In the latter there may be erosion of the cortex, some degree of expansion, and periosteal changes. Occasionally osteoplastic changes are exhibited. In the case under review punched-out lesions were seen in the skull and also a small destructive lesion in the neck of the femur. There is nothing in the X-ray appearances to make a definite diagnosis of the nature of the disease. The response of bone lesions to X-ray therapy is said to be variable. In our case the effect on the bone seemed to be minimal, although the overlying tumours decreased rapidly in size. The X-ray film after prolonged radiotherapy shows practically no change. According to Steiner (1943) the bones may be involved either by direct invasion from adjacent diseased lymphatic glands, by blood-borne metastasis, or they may be primary lesions. A few cases in which the bone lesions were the presenting symptom have been reported, and this would suggest but not prove that sometimes the disease may originate primarily in the marrow. If, however, the bones are the primary source of disease, it is surprising that no case involving the bones alone has ever been reported at necropsy.

It would seem most likely that the majority of bone lesions are metastatic and occur chiefly in the malignant type of Hodgkin's disease. The average period of life following the discovery of bone focus is probably about three and a half years.

The third feature for comment in this case was the presence of cystic swellings of the scalp overlying the bone lesions. We can find no reference in the literature to such tumours, although Jackson and Parker in a comprehensive review of the subject mention that soft-tissue swellings may be present over the circular areas of erosion in the skull. The swellings in our case suggested large localized abscesses probably of tuberculous origin, although this diagnosis was unsatisfactory because of the rarity of tuberculous disease of the vault of the skull. Examination of the contents of the swellings showed no tubercle bacilli. Guinea-pig inoculation was negative. After treatment by irradiation therapy the swellings subsided, although the underlying bone erosions remained unchanged. It is a fair inference that the soft lesions, reacting as they did, were of similar pathology to the glandular involvement in the groins.

SUMMARY

A case of Hodgkin's disease is presented and certain unusual features discussed:—

1. The presence of ulcerating lesions of the glands of the groin.

2. Cystic tumours of the head associated with bone destruction of the calvarium.

3. A close resemblance to the behaviour of multiple myeloma by malignant types of Hodgkin's disease.

4. The good response by the soft-tissue lesions to irradiation and the absence of effect on the bones.

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BILATERAL APLASIA OF THE VAS DEFERENS

By DONALD YOUNG, O.B.E.

FROM THE DEPARTMENTS OF SURGERY AND GYNÆCOLOGY, UNIVERSITY OF LIVERPOOL

THIS case illustrates an uncommon cause of male infertility. It is an interesting type of developmental anomaly which does not appear to have been previously recorded in Great Britain.

CASE REPORT

J. M., merchant seaman, aged 28 years, attended the Infertility Clinic, Liverpool Royal Infirmary, in September, 1947. He gave a history of 6 years' marriage without issue. Physical examination did not reveal any gross abnormality of the penis, testes, or epididymes, but, unfortunately, no attempt was made to palpate the vas deferens. Repeated semen analysis failed to show any spermatozoa present, and seminal fluid did not contain fructose. Testicular biopsy was advised and carried out. The sections of both testes showed normal testicular development with full maturation, the tubules containing spermatozoa (*Fig.* 566). It was, therefore, concluded that the azoöspermia was the result of a bilateral block of the vasa deferentia. Fructose is normally found in seminal vesicle secretion (Pritchard, 1947; Mann, 1948); its absence indicated that the obstruction was at the level of the ejaculatory ducts.

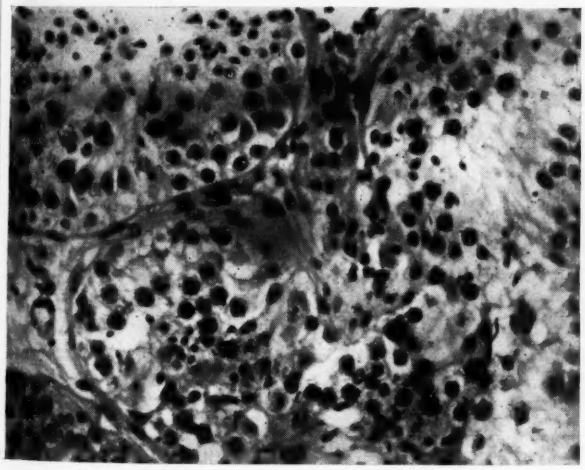

Fig. 566.—Showing normal spermatogenesis. (× 225.)

Cystoscopy and urethroscopy were carried out: the bladder and ureteric orifices looked normal but the openings of the ejaculatory ducts could not be seen. In the hope of making the ducts visible it was decided to inject a dye through the vas deferens. The left spermatic cord was then demonstrated through a small incision, but the vas deferens could not be found. The only tissue resembling it was a thin fibrous cord, and a portion of this was taken for histological examination. The left testis and epididymis were delivered into the wound and their naked-eye appearance was normal. The wound of the previous testicular biopsy showed as a small triangular scar. The epididymis was rather flattened and was separated from the testis by an unusually wide sulcus (*Fig.* 567).

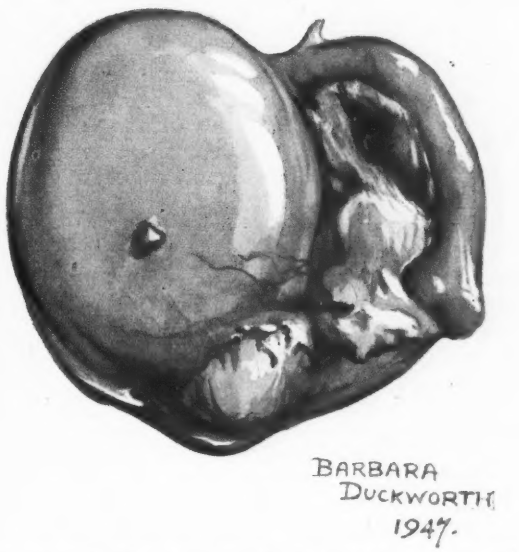

Fig. 567.—Showing the unusually wide sulcus between the testis and epididymis.

Microscopical examination of the portion taken showed only fibrous tissue. There was no evidence of a lumen or of epithelial cells.

At a subsequent clinical examination it was impossible to palpate a vas deferens on either side. Normally the vas is easily palpable as a separate entity.

THE LITERATURE

Vorstoffel (1937), in a review of the German literature up to 1936, found records of 22 cases of complete or partial absence of the vas deferens, 2 cases in which the vas deferens was represented

by a slender fibrous cord, and 2 cases in which the vas deferens and epididymis were missing. He recorded 2 cases in which there were normal testes and epididymes, with unilateral absence of the vas deferens, and absence of the kidney on the same side. These cases were found when ligating the vas in a series of more than 800 sterilization operations.

Dirr, in 1940, found 2 cases of unilateral absence of the vas deferens in a series of 451 ligature operations. In 108 cases ligature was for purposes of sterilization, in 343 cases as a preliminary to prostatectomy by endoscopy. He stated that the incidence of this anomaly is approximately 0·5 per cent in all the operations of this type reported in Germany.

Olesen and Faber reported 2 cases of bilateral aplasia in 1944.

In January, 1946, Charny, in a paper on testicular biopsy, stated that he found 4 cases of congenital absence of the vasa deferentia in the series of 308 men subjected to testicular biopsy. All 4 patients had normal spermatogenesis. No mention was made of any accompanying congenital malformation.

EMBRYOLOGY

The urinary and genital systems are closely linked in their development, and in the earlier stages open with the hindgut into a common cloaca. In the male, a part of the system primarily concerned with the urinary excretion later becomes connected to the genital gland, and the primitive urinary duct becomes part of the definitive genital duct. When development is complete the urinary and genital systems still use a common channel (the urethra, below the level of the ejaculatory ducts) to discharge their products to the exterior.

In man, two provisional organs, the pronephros and mesonephros, are formed in succession, the latter being replaced as an excretory organ by the metanephros, or permanent kidney. The excretory part of the metanephros develops from the caudal part of the nephrogenic cord, initially at the level of 1st and 2nd sacral segments. The collecting tubules develop from the ureteric outgrowth, which arises from the mesonephric (Wolffian) duct, close to its junction with the cloaca—in the 4–5-millimetre embryo.

The testes arise from genital ridges on the medial aspect of the mesonephros. The upper extremity of the paramesonephric (Müllerian) duct persists to form the appendix testis. Remnants of the caudal tubules of the mesonephric duct persist to form the ductuli aberrantes superiores, and the vasa efferentia of the testis. Some of the lower tubules become separated from the mesonephric duct to form the paradidymis in the male. The upper blind end of the mesonephric duct persists as the appendix epididymis.

The part of the mesonephric duct immediately below the level of the junction with the vasa efferentia becomes greatly elongated and convoluted to form the epididymis. The remainder of the duct develops, much later, a thick mesodermal muscular coat, and becomes the vas deferens. Each vas deferens, close to its junction with the primitive urogenital sinus, becomes dilated to form an ampulla, from which, at the 60-mm. stage, a diverticulum arises to form the seminal vesicle: the part of the duct between the vesicle and the urethra becomes the ejaculatory duct.

If development is disturbed before the 60-mm. stage, it is possible to have a fully developed testis and epididymis with an undeveloped vas deferens, ejaculatory duct, and seminal vesicle. If the epididymis is present it is unlikely that the vas is ever completely absent. It is more likely to be present in an undeveloped state. If the vas is undeveloped it would be impossible to have a normal seminal vesicle or an ejaculatory duct. If the mesonephric duct has ceased development at a very early stage, 4–5 mm., the ureteric bud would not develop and there would be an absence of the ureter and kidney on the same side.

In this case the patient was asked to come in for an intravenous pyelogram, but did not attend. However, as normal ureteric orifices were seen at cystoscopy, there is presumptive evidence that the ureters did develop.

COMMENTARY

Ligature of the vas deferens as a means of sterilization is uncommon in Great Britain, where its legality is generally thought to be in doubt. Vasostomy in the course of operation on the prostate is frequently performed, but no record has been found in this country of the observation of aplasia of the vas in this procedure. Reports from abroad, however, indicate that it is not a rare condition. It accounts for a definite, if small, percentage of cases of male sterility, and unless care is taken the condition may be mistaken for an acquired obstructive lesion of the vas.

SUMMARY

A case of bilateral aplasia of the vasa deferentia is presented.

The relevant embryology is recorded.

Associated anomalies which may be found are mentioned.

My thanks are due to Professor Charles Wells, Department of Surgery, and to Professor T. N. A. Jeffcoate, Department of Obstetrics and Gynæcology, for their advice and permission to report this case.

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FURTHER REPORT ON THE OPERATION OF ŒSOPHAGECTOMY WITH PRESTERNAL ŒSOPHAGO-GASTROSTOMY

By HERMON TAYLOR

In the BRITISH JOURNAL OF SURGERY, 1945, 32, No. 127, the writer presented an account of a new operation for upper mid-zone growths of the œsophagus whereby alimentary continuity was restored by presternal subcutaneous œsophago-gastrostomy when this was not possible inside the chest. Three cases were described in that article illustrating the steps that led to the development of the technique, but none of these was completely uneventful, the best of the three being left with an intubated presternal fistula. Further experience since that time has emphasized the necessity for sub-dividing the operation into two major and one minor stages in order to avoid contamination of the defence-less subcutaneous tissue of the front of the chest, where local cellulitis results in fistulation at the anastomosis. Staging of the operation in this way also reduces the risk of necrosis in the fundus of the stomach due to the very drastic reduction in blood-supply which it necessarily undergoes. The object of this paper is to emphasize this important modi-fication of the method as originally described, to present an account of a quite uneventful case, and a description of the patient's physical capacity with a presternal stomach during the two and a half years that have elapsed since the operations.

CASE REPORT

At the London Hospital in May, 1946, a woman, A. C., aged 53, complained of occasional midsternal pain and difficulty in swallowing during the preceding seven weeks. Otherwise she had no complaints and appeared in perfect health. She was not wasted, although she had lost some weight. There was no regurgitation of food, but occasional discomfort between the shoulder-blades on eating. Latterly she had had to give up solid foods but could still take semisolids and liquids. There were no abnormal physical signs, but radiography showed a growth in the œsophagus opposite the level of the 6th thoracic vertebra, as indicated in the accompanying illustration (*Fig.* 568). On July 4 œsophagoscopy con-firmed the presence of a proliferating growth in the lumen at 24 cm. from the teeth, 5 cm. below the cricoid cartilage. Biopsy of the growth was later reported on by Dr. W. W. Woods as being squamous-celled carcinoma. Bronchoscopy showed no abnormality.

The procedure of radical removal of the growth and anastomosis was carried out in three stages in association with Dr. P. Blackiston, who gave the anæsthetic on each occasion.

FIRST OPERATION (July 11, 1946): REMOVAL OF ŒSOPHAGUS.—Light general anæsthesia was maintained by trilene and oxygen, with the addition of curare for the abdominal part of the operation. One pint of blood was transfused. The right chest was entered through the bed of the 6th rib and the growth was found to be 2 in. long, situated above and behind the bifurcation of the trachea. (Subsequent examination of the specimen showed it to be a sessile mass projecting from the left side of the œsophagus where the pleura was a little adherent.) The œsophagus separated without great difficulty and was divided below at the cardia, and above 1½ in. proximal to the growth, the specimen including the growth with the whole œsophagus except its upper 1½ in. The cardia was brought to open on to the surface of the epigastrium as a stoma without dividing the left gastric artery. A Ryle's tube was introduced through the cardia and guided through the stomach and pylorus to the duodenum for feeding purposes, the object being to avoid the atonic distension of the stomach due to division of the vagi and the troublesome regurgitation

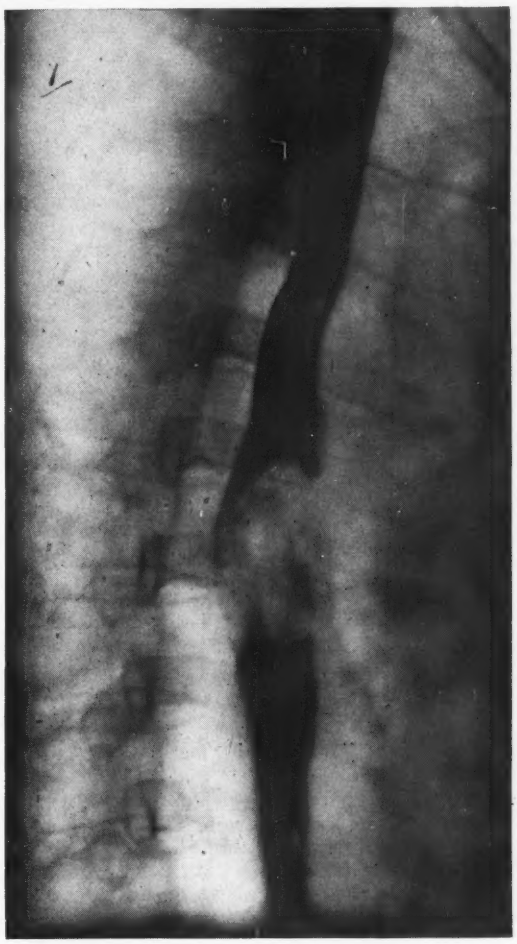

Fig. 568.—Shows the original radiograph of the growth.

from the feeding stoma which this causes. The short upper œsophageal stump was made to reach the skin above the suprasternal notch to the right of the trachea: this was facilitated by mobilizing and rotating the pharynx to the left. Other details of this stage of the operation were as described in the previous account in this JOURNAL. The chest was closed without drainage after expanding the lung. The operation lasted one and a half hours and the pulse-rate and blood-pressure remained steady throughout.

Post-operatively, on penicillin, the lung remained expanded with aspirations of pleural fluid. The trans-gastric duodenal tube was an invaluable advantage in ensuring the nutrition of the patient and simplifying the management of the stoma in the crucial post-operative period. The patient did well, her wounds healed by first intention, and four weeks later the second stage was undertaken.

SECOND OPERATION (Aug. 8): PRESTERNAL TRANSLATION OF STOMACH.—The anæsthetic consisted of gas, oxygen, and curare, one pint of blood being again transfused. The epigastrium was reopened, the cardia was freed from the skin, the left gastric vessels were divided at their origins, the vasa brevia were separated from the spleen, and the stomach was mobilized out of the abdomen except for the pylorus and its vessels. The cardia and the upper lesser curve, together with all the lymphatic tissue and glands round the coronary artery

Fig. 569.—Lateral radiograph of the presternal stomach and anastomosis.

and its œsophageal branch, were removed. Suture of the resulting defect in the stomach wall converted the body and fundus into a blind pouch ready for the presternal position. A skin-flap, bearing the upper œsophageal stump and fistula intact, was now dissected upwards to expose the deep fascia at the root of the neck. The presternal subcutaneous tunnel was made, and the gastric fundus was drawn up beneath the skin as high as the neck and fixed there by suturing the stumps of the vasa brevia to the deep fascia above the clavicles. The skin-flap was then turned down again and sutured in its original position with its external œsophageal fistula preserved, but now lying immediately over the fundus of the stomach. The actual anastomosis between the two was left to a final stage in order to avoid all risk of contaminating the tunnel in the presternal cellular tissue. Drainage was established to the space on each side of the stomach. The pyloric antrum now presented at the epigastric incision and here a small straight-through gastrostomy was performed for feeding purposes as before. (In view of the patulous atonic pylorus described after vagotomy for ulcer, it was interesting to note that in this case the pylorus was firmly closed both at this stage and at the time of œsophagectomy—so much so that great difficulty was experienced in coaxing the feeding catheter through the sphincter.)

Examinations of the specimens removed at the two operations confirmed the diagnosis of squamous-cell carcinoma, but no secondary deposits were found in the lymph-glands either near the growth or by the cardia or lesser curve in the second specimen.

Post-operatively the skin-flap healed well and a barium X-ray examination by way of the gastrostomy with the

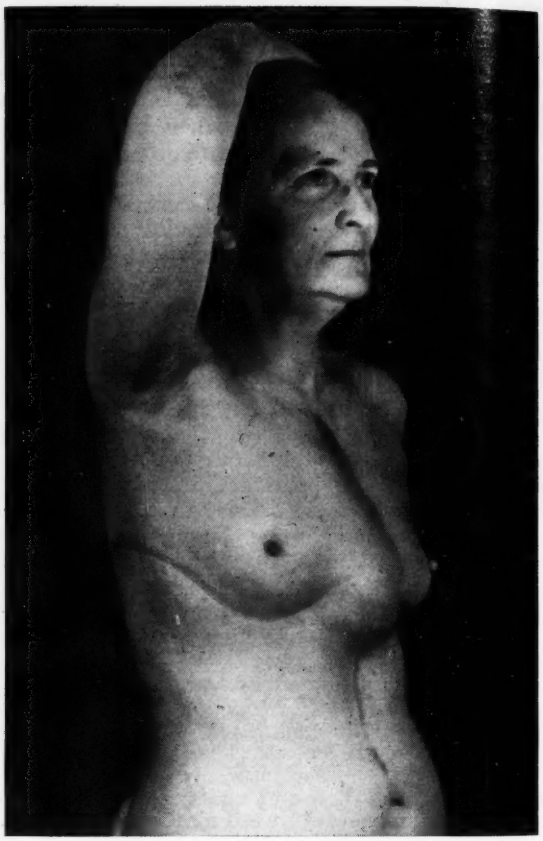

Fig. 570.—Shows the operation scars and indicates the appearance of the subcutaneous stomach.

patient inverted showed that the fundus had remained where it was sutured at the level of the suprasternal notch (*Fig.* 569).

THIRD STAGE, MINOR OPERATION (Aug. 29): THE GASTRO-ŒSOPHAGEAL ANASTOMOSIS.—Under gas, oxygen, and pentothal, a transverse incision was made through the upper fistula. The œsophageal stump was separated from the skin and implanted into the fundus of the stomach beneath it with a single row of interrupted sutures.

The patient did well and one week later was swallowing liquid food normally. The gastrostomy tube was removed and a secondary suture of the opening was carried out to expedite progress. The patient was discharged on Oct. 24, taking ordinary diet, having been kept in hospital longer than was necessary in order to study the effects of the various stages.

PROGRESS.—She has been seen on four or five occasions in the two and a half years that have elapsed since the operation. She has travelled about the country in trains in the ordinary way, has eaten ordinary food, and her nutrition and vigour are unimpaired. She has passed through an attack of influenza and does regular work of an administrative nature. She is hungry for her food and can be satisfied when she has eaten it. She is able to eat a full-course meal of ordinary articles of diet, although she

has to eat slowly. There has been no regurgitation into her mouth. She is conscious of the presence of the subcutaneous stomach, which gets distended if she eats too quickly, but she has learnt to reduce the size of it by pressing on it with her hand. She has no other symptoms from the presence of the stomach in its unnatural position (*Fig.* 570). An intelligent person, she writes as follows :—

"Life with a presternal stomach is surprisingly natural. I have a keen appetite, and know undoubtedly when I am hungry. I find it best not to take fluid with meals, as it takes up too much valuable space—meals being about two-thirds of a usual size for an adult. Anyone at the table not knowing it, would never guess there was anything abnormal about me. There is some distension after the evening meal, although that be slight and simple. There is no regurgitation, but I frequently need to expel a little 'wind' upwards by pressing my stomach. I take a small teaspoonful of magnesium trisilicate after each meal, again just before sleeping, and also at 2.30 a.m.

"During the day I am practically unconscious of my stomach's position. I walk a normal distance with ease, spring, and enjoyment; but never run for a bus or anything. Bending over forwards is uncomfortable, causing a sense of pendulous weight, as does lying on either side, but I sense no unusual pressure as regards breathing . . .

"Carrying any weight over about six or seven pounds causes a strain on each side of my upper chest, just below the collar-bone, and so I do not attempt lifting a suitcase.

"I sleep reclining almost upright on a couch bed, with arms; and always have a thermos of hot water and some biscuits at hand.

"The chief, practically the only, complaint to be made, is that most mornings I am awakened about four-thirty by abdominal gurglings, which is a warning to sip a warm drink, and eat a biscuit or two. Otherwise my stomach seems to get completely sucked inwards, till only bone is felt, the abdominal scar gets hard as whip-cord, and in a second or two a most uncomfortable hard lump about the size of an egg, comes at the apex of my stomach, giving a quite alarming sensation of strangulation at my throat. But by quickly giving the stomach a little to do, the discomfort goes quite away in about three minutes and the stomach gets soft and normal again."

CONCLUSION

My object in reporting this case is to show that presternal anastomosis is a feasible procedure and that a patient can live a perfectly normal life with it. I would not like it to be understood, however, that I practise it as a routine procedure. The one-stage endothoracic resection and anastomosis with a single crisis and short convalescence is obviously the procedure of choice for growths of the lower third of the œsophagus. It is, however, not so radical a dissection either in the chest or in the abdomen, and for middle-third growths of the œsophagus I prefer the more tedious but more thorough excision with presternal anastomosis which I have described.

A METHOD OF DEFUNCTIONING THE BLADDER AND RECTUM IN ADVANCED PELVIC CARCINOMA

By KEITH POWELL

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THE comparatively fit patient with an extensive pelvic cancer presents an infrequent but difficult problem in treatment. Particularly is this the case when the disease arises in the uterine cervix, for there may be no extension beyond the pelvis and the growth is radio-sensitive; but the patient's life is rendered miserable by fistulæ of the rectum or bladder, or both, while the necessity for avoiding damage to these organs may impose limitations on radiotherapy.

Any surgery undertaken in these advanced cases would have two objects—to mitigate the patient's discomfort, and to place her in the best position for treatment by the radiotherapist. With involvement of the rectum or bladder alone, the first object at any rate can be attained by colostomy or by ureterocolostomy. If, however, both organs are invaded, and actual or potential fistulæ exist, the problem becomes more complex, and the simplest surgical possibilities are not attractive. Colostomy combined with bilateral ureterostomy is a doubtful improvement in the patient's comfort, leaving her as it does with three fistulæ, two of which discharge continuously. Further, ureterostomy is by no means free of complications and difficulties peculiar to itself. Colostomy with implantation of the ureters into some part of the bowel would give an excessively fluid colostomy discharge.

There remains a third possibility, namely, colostomy combined with the construction of an extrapelvic urinary reservoir, emptying at intervals by an opening accessible to the patient and not liable to stenosis.

The writer had occasion to devise a procedure of this type in the case of a woman, aged 61, who presented with a stage III carcinoma of the cervix and a vesicovaginal fistula; posteriorly the rectal wall was invaded and a rectovaginal fistula was obviously only a matter of months. Withal she was in good general condition, although the urine was infected and the concentrating power of the kidney as shown by the intravenous pyelogram was not good. As subsequent laparotomy confirmed, there was no demonstrable spread of the growth beyond the pelvis.

By a two-stage operation, the ileocæcal region was isolated, and converted into a 'bladder' emptying through the appendix. Had the latter not been available, it was proposed to construct a mucous-lined tube after the manner of a Janeway gastrostomy.

First Stage: Through an oblique muscle-cutting incision in the right iliac fossa, the ileum was divided about 12 in. from the ileocæcal junction, and the ascending colon at the hepatic flexure. All four divided ends were closed, and continuity of the bowel restored by side-to-side ileo-transverse-colostomy. The stump of the ileum was carried across to the left of the spine, and anchored to the posterior parietal peritoneum overlying the left

ureter. Finally a tube was sewn into the ascending colon, and appendicostomy was performed through a stab incision about 2 in. internal to the anterior superior spine.

Convalescence was uneventful; the excluded bowel was washed clear by the tube and appendicostomy, using sodium bicarbonate solution in view of the considerable quantity of mucus produced. On the twelfth day the tube was removed, and the appendicostomy alone used for washouts and drainage.

Second Stage: Three weeks later the abdomen was opened by a right paramedian incision. The ureters were divided at the pelvic brim, and drawn up retroperitoneally with forceps, to emerge through the posterior parietal peritoneum just above the stump of the ileum. After cutting off the excess they were implanted into the ileum in the usual way. As each ureter entered the bowel directly it left its normal bed, the risk of necrosis was minimal, and it may be noted that implantation was much

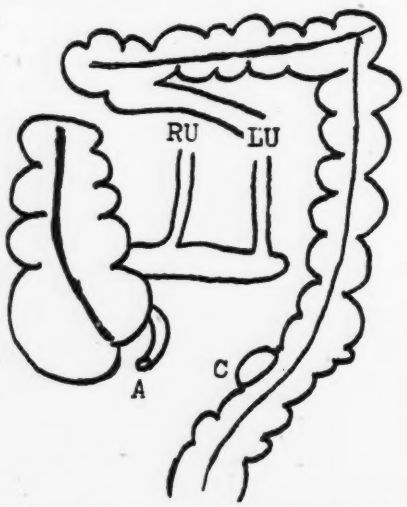

FIG. 571.—Completed operation for exclusion of pelvic viscera. **RU, LU,** Ureters; **A,** Appendicostomy; **C,** Colostomy.

easier than usual. A left inguinal colostomy completed the operation. A pelvic drain was inserted for 48 hours, but was probably not necessary.

Fig. 571 shows diagrammatically the completed operation.

Convalescence again was smooth, apart from slight pyrexia from the third to the seventh day. The appendicostomy was drained freely for the first week. Full use was made of chemotherapy and of intravenous saline and sodium sulphate during the post-operative period.

A fortnight after the operation she was up and about, with the colostomy acting once daily in response to a washout. By spigoting the appendicostomy tube, her period of retention of urine was gradually increased, until finally it reached 10 to 12 hours. Her daily output at this period averaged five pints; the urine was still infected, and the blood-urea was 48 mg. per cent. On discharge, the colostomy belt was provided with a hole to transmit the appendicostomy tube, which was held firmly in place by a rubber shield. Daily washouts were continued, and she was advised not to try to retain her urine for more than 6 to 8 hours.

COMMENT

As far as can be judged, the procedure described seems materially to have increased the comfort of this patient, and to have enabled her to resume a reasonably active life. For this reason alone, it would appear to justify the risk attached to two moderately severe operations. It remains to be seen if by leaving the radiotherapist a clear field, any prolongation of life can be obtained.

A possible objection to the operation is that absorption might take place from the urine stored in the cæcum, but in this case the blood-urea does not seem to have been affected by the operation. Further, in the standard operation of ureterocolostomy, the evidence points to the urine being stored in the colon, and not in the rectum alone, so that in these cases it comes into contact with an extensive absorbing surface. Even so, it might have been better to have drained the appendicostomy

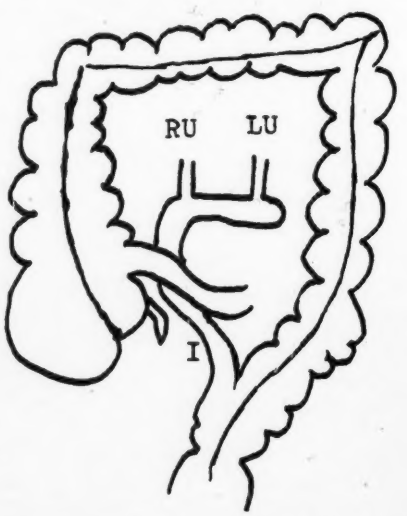

Fig. 572.—Suggested ureterocolostomy with interposition of a loop of ileum. **I,** Isolated ileum inserted between ureters and colon.

continuously, at any rate during the day; but the patient preferred intermittent emptying, and the point was not pressed.

Possible Use of an Isolated Loop of Ileum in Ureterocolostomy.—The ease with which a sound uretero-intestinal anastomosis was effected in this case prompts one to suggest that a defunctioned loop of ileum might have a useful place in the ordinary operation of ureterocolostomy. While it is undesirable to complicate a standard operation, it is well known that, when performed for carcinoma of the bladder, ureterocolostomy carries a considerable risk of peritonitis. Shackman (1947) records that 7 peritoneal infections were observed in 12 fatal cases in the series reported by him.

What steps can be taken to diminish this risk, assuming that an intraperitoneal operation is performed, and that the technique of anastomosis is sound? There appear to be two, namely:—

a. Use of a defunctioned segment of bowel to receive the ureters: this principle has been utilized by Shackman and others. In all cases a colostomy is required.

b. An anastomosis involving minimal freeing of the ureter, so that its blood-supply is not impaired.

To fulfil the above requirements, and at the same time to avoid a colostomy, an indirect anastomosis, inserting a loop of the mobile ileum between the colon and ureter would appear to have something to commend it. *Fig.* 572 shows one of several possible methods of ureterocolostomy on this principle which suggest themselves; such operations would best be performed in two stages, isolation of the bowel, followed by transplantation of the ureters two to three weeks later.

The suggested advantages are :—

1. Only a short length of mobilized ureter is required, as the bowel is readily brought to meet the ureter immediately it leaves its normal bed.

2. Provided that there is no excessive fæcal reflux into the isolated bowel—and this admittedly is a doubtful point—strain on the suture line should be slight. When the anastomosis has been completed, the objection to the presence of blind loops of bowel—that fæces tend to collect and stagnate therein—should not apply, as there is a constant flow of fluid down the loop.

3. The operation is entirely extrapelvic—a feature perhaps of some value where a subsequent extensive pelvic dissection is contemplated.

SUMMARY

1. A method of exclusion of the pelvic viscera is described.

2. A modified technique of ureterocolostomy, aiming to diminish the risk of peritonitis, is suggested.

REFERENCE

SHACKMAN, R. (1947), *Brit. J. Surg.*, **35**, 140.

MENINGIOMAS IN PHARAOH'S PEOPLE*

HYPEROSTOSIS IN ANCIENT EGYPTIAN SKULLS

BY LAMBERT ROGERS, CARDIFF

"*What a devil hast thou to do with the time of the day?*"—*I Henry IV*, I. ii.

THE photographs (*Figs.* 573, 574, 576) are of two skulls from ancient Egypt, one from the Royal Excavations at Helouan from the First Dynasty (*circa* 3400 B.C.), the other from Meydum from the Twentieth Dynasty (*circa* 1200–1100 B.C.). Through the kindness of Professor D. E. Derry, of the Department of Anatomy in the Medical School at

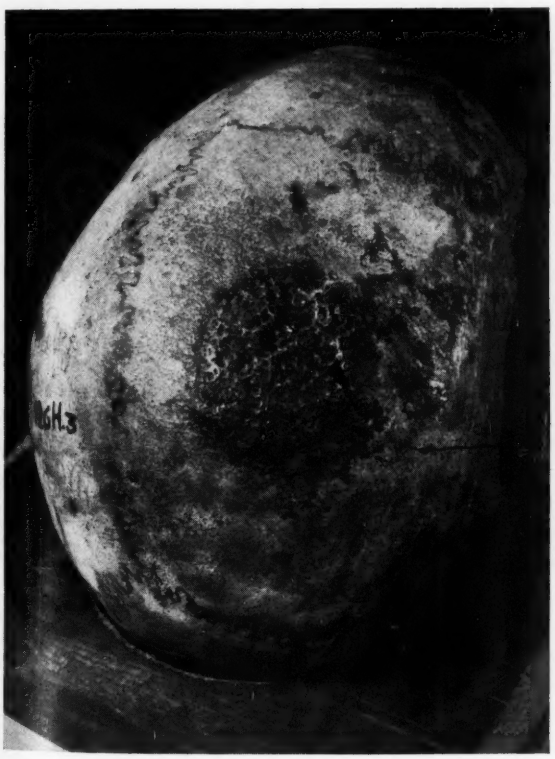

FIG. 573.—Outer appearance of calvarium of skull from the Royal Excavations at Helouan (First Dynasty, *circa* 3400 B.C.). A circumscribed hyperostosis is seen in the right parieto-occipital region.

FIG. 574.—Inner aspect of same skull as in *Fig.* 573, showing hyperostosis involving inner table to the right of the superior longitudinal sinus.

* Read before the Society of British Neurological Surgeons on Nov. 26, 1948.

FIG. 575.—X-ray appearances of hyperostosis shown in *Figs.* 573, 574.

Cairo, and of Mahomed Kamal Hussein, F.R.C.S., also of Cairo, I had an opportunity of examining these skulls when I was in Egypt towards the end of 1947.

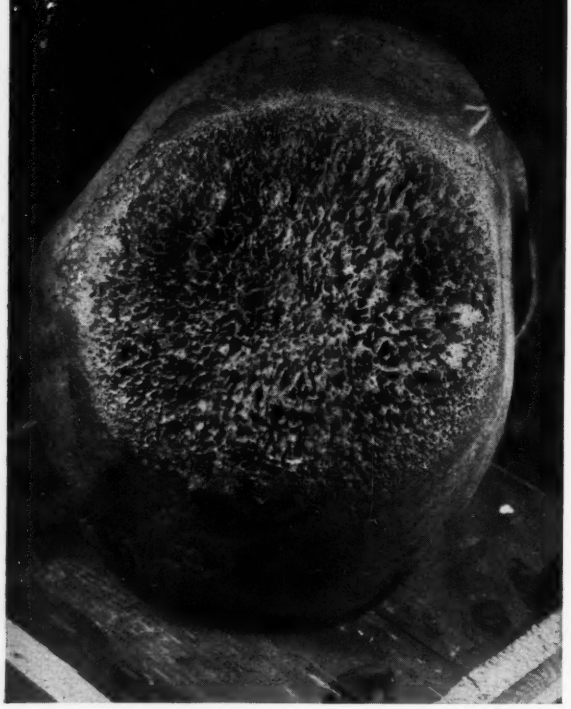

FIG. 576.—Outer appearance of calvarium of skull from Meydum (Twentieth Dynasty, *circa* 1200–1100 B.C.). Extensive hyperostosis with honeycomb appearance.

The hyperostosis in *Figs.* 573 and 574 was probably produced by a parasagittal meningioma in the right parietal region, and the large vascular channels to be seen on the side of the hyperostosis, and leading to it, support this suggestion. We might speculate that the patient was the subject of epileptic fits and was hemiplegic, with the left leg more affected than the left arm.

The diffuse honeycomb type of hyperostosis spreading over the vertex of the Twentieth Dynasty skull (*Fig.* 576) suggests the reaction to an angioblastic or sarcomatous meningioma. The X-ray appearances of the two skulls are shown in *Figs.* 575, 577.

For drawing my attention to these skulls and enlightening me as to their origin and probable date, and for the excellent photographs and X-ray films, I am very much indebted to Professor D. E. Derry.

Through the kindness of Mr. Le Fanu, Librarian of the Royal College of Surgeons of England, I have been able to consult some translations of the Papyrus Ebers and the Edwin Smith Surgical Papyrus, but in neither of the ancient Egyptian medical documents is there any reference to what might possibly be regarded as cranial hyperostosis, and as far as I know no previous reference has been made to these rather unique specimens of ancient Egyptian skulls.

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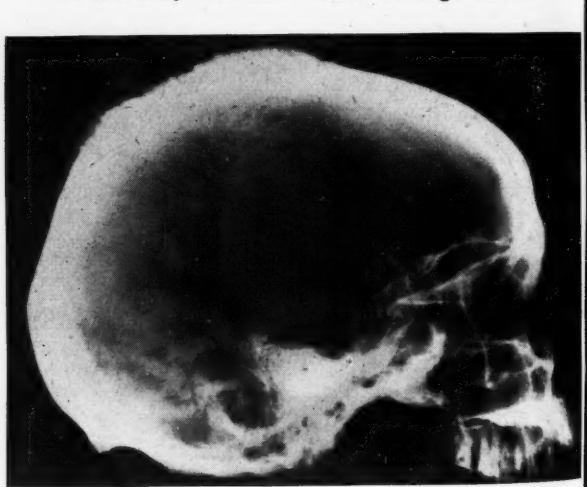

FIG. 577.—X-ray appearances of hyperostosis shown in *Fig.* 576.

SHORT NOTES OF RARE OR OBSCURE CASES

A CASE OF BENIGN HEPATOMA

By W. R. HUNTER, Liverpool

Although primary carcinoma of the liver is a common neoplasm amongst the natives in certain parts of Africa and China, benign hepatic-cell adenomata requiring surgical intervention are not often observed, so it was considered worth while placing this case on record.

CASE REPORT

History.—E. H., a married woman aged 28 years, attended first in February, 1948, complaining of a swelling just below the left costal margin and near the midline anteriorly. Her attention was first drawn to the lump some eight months previously, owing to a feeling of pressure and a dragging sensation in the upper abdomen. She said the symptoms were only present when she was standing or walking and that when she lay down the swelling disappeared. If she turned on to her right side, however, she experienced what she described as "a pulling sensation on the left ribs". Since first noticing the swelling she thought it had become a little bigger. There were no other symptoms and nothing else of importance in the history.

On Examination.—She was a pale well-nourished woman. With the patient recumbent, nothing abnormal could be detected on palpation of the abdomen, but when she was standing, and especially if she bent forward a little, a tumour could be palpated in the left epigastrium, in the angle between the ensiform cartilage and the costal cartilages. The swelling felt slightly irregular, was firm in consistency, and about 1¼ in. in diameter. It was not tender on pressure, and moved on respiration. There was no impulse on coughing, and the liver edge could not be detected. No other abnormality was found in the rest of the examination.

A plain radiograph of the abdomen revealed no abnormality, and a bismuth meal showed no evidence of any lesion in the stomach, duodenum, or intestines. There was, however, a general visceroptosis. The chest radiograph demonstrated an old calcified focus in the right apex, otherwise the lung fields were clear. The blood-picture showed her to have 4,800,000 R.B.C.'s per c.mm., with a 96 per cent Hb. The white-cell count was 7400 per c.mm., with 76 per cent polymorphonuclear leucocytes, 21 per cent lymphocytes, 2 per cent monocytes, and 1 per cent eosinophils. The blood W.R. was negative.

Although cysts and tumours of the liver and pancreas were considered in the differential diagnosis, no definite conclusion was reached as to the nature of the swelling.

At Operation.—On March 3, under curare pentothal anæsthesia, the abdomen was explored through a midline supra-umbilical incision. There was no free fluid in the peritoneal cavity. In the left lobe of the liver a tumour was felt. It was firm in consistency and nodular, and over an area of about 1 in. in diameter projected from the anterior surface of the liver (*Fig.* 578). The main portion of the tumour, however, was embedded in the left lobe and appeared to extend almost to the inferior surface. The rest of the liver appeared normal, and no other abnormality was discovered in the abdomen.

It was decided to attempt removal of the tumour. A blood transfusion was begun. A plane of cleavage was found between the mass and the liver, and the former shelled out fairly easily. Bleeding was not great, but a few large veins were encountered and displayed as strands connecting the tumour to the liver as the dissection progressed. These were ligated before cutting.

Hæmostasis was secured by packing the cavity with oxidized cellulose gauze and suturing with catgut. A portion of the falciform ligament was reflected on to the anterior surface of the left lobe and used to prevent cutting out of the sutures.

A small corrugated drain was left down to the suture line, and the abdomen was closed.

On the second day, there being no discharge, the drain was removed, and the wound healed without incident. The convalescence was smooth, and the patient was discharged on the seventeenth day.

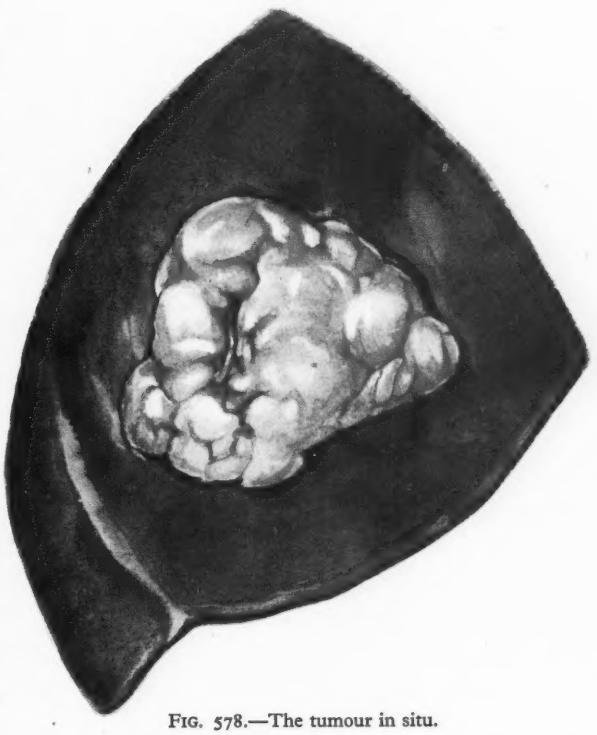

Fig. 578.—The tumour in situ.

Pathological Report.—

Macroscopical.—Irregular, nodular, hard mass measuring 2 × 1¾ × 2¼ in., covered with a thin fibrous capsule. Cut surface shows irregular areas of liver tissue intersected by bands of fibrous tissue (*Figs.* 579, 580).

Microscopical.—The general picture is that of multilobular hyperplasia with cords of liver cells of varying sizes surrounded by strands of fibrous tissue containing new and old fibrocytes, polynuclear cells, plasma cells, and lymphocytes. The nodules are composed largely of new cells which show irregularity in size and arrangement without lobular pattern. The number of binucleate forms of hepatic cells is increased and their distribution is generally perivascular. Multinucleate forms are not present. There is some bile-duct hyperplasia. (*Fig.* 581.)

Diagnosis.—An hepatic adenoma involving hyperplasia of liver cells and bile-ducts.

DISCUSSION

Classification and Aetiology of Hepatic Tumours.—The classification of primary tumours of the liver is a matter of controversy. Considerable confusion exists in the use of the term ' hepatoma '. Swalm and Morrison (1939) called the tumour a ' hepatoma ' when it arose from the liver cells and a ' cholangioma ' when originating from the intra-hepatic bile-ducts. A third group, arising from both liver cells and bile-ducts, they denominated ' mixed '

2. Cholangiomas :
   a. Adenomas of the intra-hepatic bile-ducts, solid or cystic.
   b. Carcinomas.
3. Cholangiohepatomas of both liver-cell and duct elements of varying malignancy.
4. Tumours primary in the liver but not of specific hepatic elements, e.g., angiomata, fibromata, and tumours arising from adrenal rests, etc.

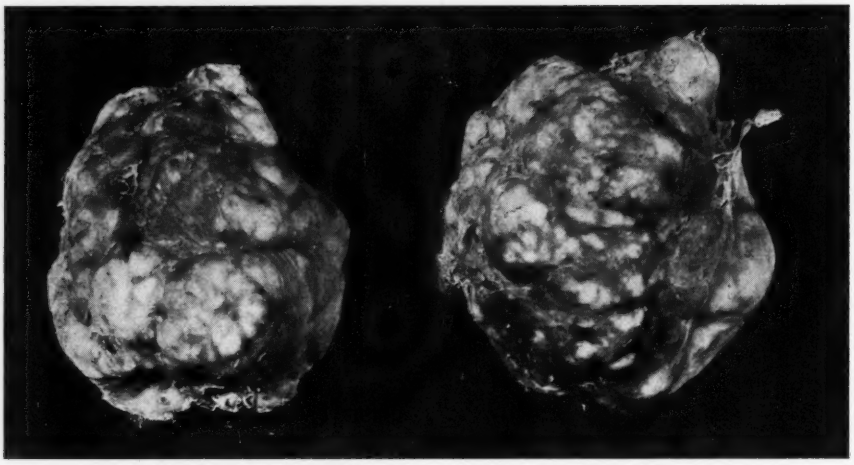

FIG. 579.—The tumour cut in half, showing size, nodular-outer surface, and its delicate capsule. (*Natural size.*)

FIG. 580.—Cross-section of tumour showing intersecting strands of fibrous tissue. (*Natural size.*)

tumours. On the other hand, Ewing (1940) included under the title ' hepatoma ' both benign and malignant tumours irrespective of their site of origin. The issue has been further complicated by the introduction of the term ' hamartoma ' by Albrecht (1904) to describe the tumour-like malformations due to errors of development of liver tissue. He considered that the growth potential of a hamartoma was not as great as that of the true tumours. For practical purposes the following classification of primary tumours of the liver, as suggested by Warvi (1945), appears to be the simplest and most useful :—

1. Hepatomas :
   a. Liver-cell adenomas.
   b. Liver-cell carcinomas, with or without cirrhosis.

The tumour in this instance is a mixed type—a cholangiohepatoma. An adenoma must be encapsulated and of liver-cell or bile-duct origin, so the term excludes all those showing invasive properties and makes such a term as ' malignant adenoma ' paradoxical. Various theories have been suggested as to the mode of origin of this type of neoplasm. Rolleston (1905) believed that the majority were of embryonic origin and in the nature of congenital rests, whilst others supposed that mechanical segmentation of liver tissue, due to tight lacing or the wearing of belts, was the initiating factor. Again, the tumour may be evidence of nodular compensatory hyperplasia, a reparative phenomenon occurring as a result of liver damage by cirrhosis, sepsis, melanoma, and poisons of various kinds. In this instance the

hyperplastic nodules are not true neoplasms because they are not encapsulated, but are really areas of liver regeneration. Tumour formation, however, may be superimposed upon these hyperplastic conditions, and the close relationship of hepatic adenomas and carcinomas to these regenerative states is well known. The theory has also been put forward that liver adenomas arise from misplaced adrenal rests. This must be of very rare occurrence, and in any case the tumours would be adrenal and not liver adenomas.

Of recent years much experimental work has been undertaken in the production of liver tumours, both adenomas and carcinomas, by means of chemical substances, and as a result new light has been thrown on the probable aetiology of these tumours.

Schmidt, in 1924, demonstrated that mice fed on scarlet red developed adenomas in the liver, and he assumed that these were caused by a specific hepatogenic action of the dye. In 1935 Sasaki and Yoshida showed that *o*-amino-azotoluene, when given orally or by injection, produced adenomas and carcinomas of the liver of mice. These results have been confirmed by other workers.

It was subsequently found by Kinosita (1937) that the substance known as ' butter yellow ' readily produced liver tumours. Orr (1940) confirmed these findings in his own experiments, and also demonstrated cirrhotic changes. He showed, however, that tumour formation occurred whilst the cirrhotic changes were in their early and reversible stages.

Although the azo-compounds are active in producing hepatic neoplasms, other substances have a similar effect. Ilfield (1936) introduced dibenzanthracine pellets into the mouse liver and produced hepatic carcinoma, but more interesting were the findings of Cook and others (1937). These investigators produced bile-duct proliferation and hepatoma-like tumours following the application of 3 : 4 : 5 : 6 dibenzcarbazole to the skin of mice. In 1941 Edwards produced benign hepatomas in mice with carbon tetrachloride.

It appears, therefore, that certain substances have a selective carcinogenic action on the livers of animals, and it may be that a similar effect occurs in humans, and is the cause in some instances of both benign and malignant hepatic neoplasms.

Although normally found in middle life, cases occur in both the very young and the very old. The right lobe is the commoner site, especially its inferior surface, although any portion may be affected.

The tumour may be large or small, some being as big as a grape-fruit and others no larger than a cherry. They may be single or multiple and are yellowish-brown or yellowish-red in colour, and have a tendency to become pedunculated. Degenerative change, fatty or cystic, with or without hæmorrhage, is not unusual, and calcification may be noted.

Many believe that the tendency to malignant change in these benign liver tumours is very great. Ewing (1940) said that they were all potentially malignant. This view was supported by Wallace (1941), who advocated the removal of an area of normal liver around the tumour on this score, even when the swelling appeared to be obviously benign.

Histologically the structure resembles the pattern of a liver nodule with cords of polyhedral cells. These cords, however, are not regularly arranged and form with the capillaries solid masses. Bile-duct hyperplasia may or may not be seen. Malignant change is heralded when invasion of the veins occurs or the tissue progresses through its capsule.

Incidence and Clinical Aspects.—As regards the incidence of benign hepatoma necessitating surgical interference, Hoffman in 1942 cited 58 cases in the literature and described 2 of his own, Since then Warvi (1945) has reported 3 instances. Branch, Tunning, and Skinner reported another in 1945, whilst Benson and Penberthy (1942) and Packard and Stevenson (1944) have reported successful resections in children of 13 and 7 months respectively. In 1947 Franklin and Downing described 1 case, and in the same year Duckett and Montgomery reported 3 cases in which the tumours were removed.

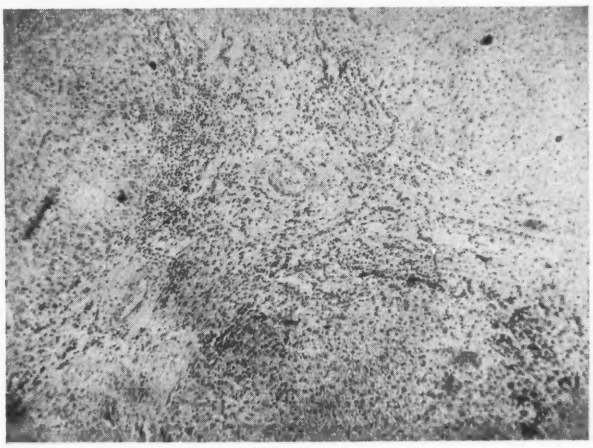

FIG. 581.—Microphotograph showing three liver-celled nodules intersected by fibrous tissue, round-cell infiltration, and numerous bile-ducts. (× 105.)

Benign hepatomas cause symptoms owing to their weight and size, or by pressure on surrounding viscera such as stomach, duodenum, or kidney, or by obstructing the bile-ducts. Occasionally they present as an acute abdominal emergency, as a result of torsion, or a hæmorrhage into the peritoneal cavity.

The majority of cases coming to surgery are not accurately diagnosed prior to operation, but laparotomy is indicated on account of pressure symptoms or the danger of malignant change in any tumour in the abdomen of doubtful origin. Beling (1941) advised peritoneoscopy as a most useful aid in diagnosing these tumours and for means of biopsy.

Keen in 1892 first reported a successful resection of a benign hepatoma, and since then many techniques have been adopted and all are aimed at the control of hæmorrhage.

The older methods of exteriorization by pins to hold the liver in place and the elastic tourniquet are now out of favour, and suturing of various types aided by diathermy and the cautery are the methods of choice.

To control hæmorrhage during the resection the application of clamps is useful, but if these can be satisfactorily applied the tumours are easily accessible or pedunculated and in any case the resection

would be easy. Holding the liver and applying pressure during the resection is difficult, and although pressure on the vessels in the gastro-hepatic omentum helps to control the bleeding, it cannot be continued for very long without causing serious liver ischæmia.

The tendency to pedunculation makes removal of the tumours on the free edge and even the inferior surface anteriorly comparatively easy, but great difficulty may be encountered in removing hepatomas high up on the anterior surface, far back on the inferior surface, or in close relation to the bile-ducts.

Nevertheless, when encountered, these simple tumours should be removed, and with care this can usually be successfully accomplished. The danger of malignant change is great, and although removing an area of surrounding healthy liver is advisable, when the tumour enucleates easily this method is probably adequate.

SUMMARY

1. A case of benign hepatoma is described.

2. The aetiology, pathology, and clinical features of these tumours are reviewed.

In conclusion I would like to thank Dr. Findlay, Superintendent of Broadgreen Hospital, for permission to publish this case; Professor Wells for his advice at the time of the operation; and Miss Duckworth, of the Department of Surgery, for the coloured drawing.

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A CASE OF BILHARZIA OF THE APPENDIX, WITH STRANGULATION OF ILEUM

BY MARK HUGHES

MEDICAL OFFICER, COLONIAL MEDICAL SERVICE, GOLD COAST COLONY

THE following case is thought to have been sufficiently unusual to warrant publication.

CASE REPORT

A male African, aged about 25 years, was brought on a donkey to Navrongo Hospital, in the Northern Gold Coast. He complained of agonizing abdominal pain and absolute constipation, of three days' duration. The pain had started to the right of, and below, the umbilicus, but had soon become generalized. Vomiting had occurred on the way to hospital.

ON EXAMINATION.—A desperately ill patient with board-like rigidity of the abdominal wall. Fæculent vomiting occurred during examination. The pulse-rate was 120, and the temperature was subnormal.

Morphine was given, but unfortunately no saline apparatus was available. Two hours later the pulse-rate had dropped to 96, and the shock engendered by the journey to hospital had worn off. Although on admission the patient had appeared moribund, it was now considered that he was fit for operation.

AT OPERATION.—Under open chloroform anæsthesia the abdomen was opened by a right paramedian incision. After the escape of some malodorous brown fluid, a blackened gangrenous loop of gut presented, strangulated at its base by a fleshy band. Attempts to manipulate and thus loosen the band were unsuccessful, but on dividing it between clamps one end was easily freed, and was found to consist of the distal half of the vermiform appendix. The tip of the appendix bore a plum-coloured tumour, about ¾ in. (1·9 cm.) in diameter.

Appendicectomy was completed. The gangrenous loop of gut was found to consist of the terminal 2 ft. (61 cm.) of the ileum, and resection was necessary down to the ileocæcal valve. The distal ileal stump was closed, and ileocæcostomy performed, the proximal end of the ileum being utilized for a temporary ileostomy.

As the last stitches were being inserted the patient collapsed, and attempted resuscitation failed to prevent death.

PATHOLOGICAL REPORT.—The appendix was sent to Dr. R. D. Reid, Pathologist at the Medical Research Institute, Accra. Dr. Reid reported that the tumour contained ova of *Schistosoma hæmatobium*, surrounded by fibrous tissue. Around the whole mass was a subserous hæmatoma, possibly due to terminal strangulation.

COMMENT

Surgically speaking, the case was a failure, to which inexperience, primitive conditions in a 'bush' hospital, and lack of equipment and skilled assistants, not to mention the grave condition of the patient,

were all contributory features. The interest of the case lies in the pathology, and in the mechanism of strangulation.

Bilharzia ova are frequently found in the appendix in the areas where the disease is endemic, and have been reported from Egypt, Nigeria, South Africa, South America, and the Dutch East Indies. The first case of bilharzia of the appendix was reported by Burfield and Shaw (1906) at St. Bartholomew's Hospital, London, and the condition has been rediscovered at intervals since that date.

Lovett-Campbell and Rose (1936), and Rosin (1944), found that *Schistosoma hæmatobium* was the species responsible for all the cases of bilharzia of the appendix described by them. Gelfand (1944) considered that this species was most often responsible for appendiceal lesions. Ova of both *S. mansoni* and *S. japonicum*, however, have been recorded in the appendix.

The presence of bilharzia ova in the appendix is associated with chronic inflammation, and is characterized by fibrosis and by the presence of subserous 'tubercles', in which giant-cells are found (Rosin).

Those who have described the condition have differed in their estimates of the importance of bilharzia in the production of appendicitis. Rosin attached some importance to the condition in the production of acute appendicitis. Cawston (1931) considered that chronic appendicitis in small boys in Natal was so commonly due to bilharzia that it was frequently unreported. Lovett-Campbell and Rose found bilharzia ova in the appendices of 57 per cent of sufferers from urinary bilharzia who were subjected to appendicectomy. Barsoum (1934), on the other hand, considered that bilharzia of the appendix was a benign condition, and that it did not cause appendicitis. He noted that in rural Egypt, where bilharzia is rife, appendicitis was extremely uncommon. The same phenomenon occurs in West Africa. Perhaps the simple rural inhabitants of such areas are less inclined than their urban counterparts to complain of the rather vague symptoms which often lead to a diagnosis of chronic appendicitis.

The mechanism of intestinal strangulation in this case was an uncommon one, and resembled the strangulation by knotting of Meckel's diverticulum illustrated by Bailey (1944). Wakeley and Hunter (1943) refer to the possibility of the appendix acting as a strangulating band. In this case it is probable that the tip of the appendix became adherent owing to inflammation caused by bilharzia, and became twisted round the lowest loop of the ileum. At the onset of strangulation the knot was drawn so tight that the tumour-laden tip of the appendix itself suffered strangulation, resulting in the production of the hæmatoma described above.

SUMMARY

A case is described in which a bilharzial appendix caused strangulation of the ileum, and the literature of the condition is briefly discussed.*

I am indebted to Dr. R. D. Reid for his report on the pathological specimen, and to the Director of Medical Services, Gold Coast, for permission to publish this case.

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* Whilst this article was in the press, Gelfand (1948) has discussed the question of whether bilharzia causes clinical appendicitis, and has concluded that it does not often do so. He cited the rarity of appendicitis in Africans in Southern Rhodesia, although bilharzia is common in that area.

SUDDEN DEATH AT OPERATION DUE TO TUMOUR EMBOLUS

BY T. W. MIMPRISS AND ST. J. M. C. BIRT

THE following case of hypernephroma is reported as being of interest as sudden death occurred on the table while the tumour was being removed, and the subsequent post-mortem confirmed the presence of tumour embolus in both pulmonary arteries.

CASE REPORT

A woman, aged 52, gave a six weeks' history of right-sided pain and hæmaturia.

On Examination.—The patient was thin and anæmic.

Abdomen: Two separate masses were palpable in the right side of the abdomen:—

1. A mass in the loin, which moved with respiration and appeared to be about the size of a grape-fruit. It was considered that this tumour was renal in origin.

2. The second mass was palpable about 2 in. below the right costal margin and 1 in. from the midline. This tumour was about the size of a tangerine and was thought to be a secondary in the liver.

There were no other abnormal physical signs.

Investigations.—

Cystoscopy: Bladder normal. Blood seen spurting out of the right ureter.

Intravenous pyelogram showed non-functioning right kidney.

Retrograde pyelograms showed gross filling defect right renal pelvis.

It was thought that this patient had a renal tumour with a probable secondary in the liver.

AT OPERATION.—Transverse peritoneal exposure from the tip of the twelfth rib to the umbilicus on the right side. On opening the peritoneum the diagnosis was confirmed of an enormous hypernephroma of the right kidney with a solitary nodule in the free edge of the liver. In view of the pain and hæmaturia, it was

considered advisable to attempt excision of the growth and nodule. Numerous large, abnormal veins were seen on the surface of the hypernephroma, suggesting obstruction to the renal vein. This, in fact, proved to be the case, as on exposing the renal vein it was completely occluded by growth in the lumen. The vein was being dissected in order to tie it at its junction with the vena cava, when the patient, whose condition had been satisfactory during the earlier part of the operation, suddenly collapsed and died within a few seconds. All attempts at resuscitation failed.

POST-MORTEM EXAMINATION.—Post-mortem examination showed that both pulmonary arteries were completely obstructed by red, semi-solid growth identical to that found in part of the primary tumour. Section of the growth showed it to be a hypernephroma (*Fig.* 582). Apart from one secondary seen in the liver, and noted at operation, no other macroscopical secondary was found in the body after an extensive search, including examination of the brain.

COMMENT

No specific case of this nature appears to have been recorded, although Thomson-Walker (1936) states that "pulmonary embolus has been caused by the appearance of a clot or portion of growth in the renal vein durion operation".

Beer (1937) found involvement of the renal vein in 50 out of 130 cases, with the inferior vena cava involved in 8 cases. He states that multiplication of new veins on the surface of the growth indicates invasion of the renal vein. He considers it worth while to attempt removal of cases involving the renal vein alone, but not in those cases where the growth is seen projecting into the inferior vena cava.

FIG. 582.—Section through the hypernephroma.

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A CASE OF GASTRIC NEURINOMA WITH HÆMATEMESIS

BY LESLIE J. TEMPLE, LIVERPOOL

NEURINOMA of the stomach—also described as schwannoma, neurolemoma, or perineural fibroblastoma, depending on the view as to its origin—is a rare lesion. It was first described by Verocay in 1910. Christopher (1945) classified 2505 gastric neoplasms and found not a single case. Eusterman and Senty (1922) in 2168 cases and Balfour and Henderson (1927) in 58 cases of non-malignant stomach tumours found no neurinomas.

Arthur Purdy Scott (1935) examined the evidence of all the previously reported gastric tumours of neurogenic origin and accepted 32 as true nerve-sheath tumours and added 3 cases of his own. Minnes and Geschickter (1936), however, believed 102 cases amongst 931 cases of benign tumour reported in the stomach to be neurinomas. Ransom and Kay (1940) reported 4 cases and gave a very full description of the histology.

Many of the cases were discovered accidentally at post-mortem or when operating for other lesions, but a neurinoma has been observed gastroscopically (Paul and Chapman, 1945).

The only common clinical sign is hæmorrhage, as noted by Senturia (1940) and Ransom and Kay (1940), either as repeated small hæmatemeses or a massive bleeding. If the tumour is mainly intragastric it may resemble a foreign body (Sanguily and Blanco, 1945). Neurofibromata of the stomach may occur in conjunction with generalized neurofibromatosis.

The following case is reported because of its rarity and also because of the clinical features.

CASE REPORT

HISTORY.—A British Warrant Officer, aged 37, was admitted to the medical ward of a Military Hospital in India with the history that twelve hours previously he had vomited not less than three pints of blood. There was no history suggestive of peptic ulcer, although he admitted a feeling of fullness after meals for the past month. Smoking and drinking were not excessive and he had not suffered from any serious disease.

ON EXAMINATION.—He was a well-nourished man, profoundly anæmic and almost pulseless. All physical findings were negative, though deep palpation of the abdomen was not undertaken. A blood-film did not reveal the presence of malarial parasites. Hæmoglobin was 5·4 g. and a W.R. taken at the time later proved negative.

Rest was obtained by morphine and a strict ulcer régime started—sips of iced water only being allowed by mouth. Hæmatemesis was repeated and copious

melæna stools of almost unchanged blood were passed. A slow drip-blood transfusion was commenced and twenty-four hours after admission two pints of blood were given. The patient was still vomiting blood and hæmoglobin was 4·5 g.

At this stage I saw him, diagnosed hæmorrhage from a large eroded vessel in a peptic ulcer—in spite of the negative history—and decided upon operation.

AT OPERATION.—Four pints of blood were given rapidly before operation commenced and there was a slight improvement in his pulse although blood-pressure was not clearly registrable. The six lower intercostals on each side were injected with novocain and after a small pentothal induction anæsthesia was maintained with gas and oxygen only.

FIG. 583.—Low-power view of normal gastric mucosa and underlying tumour.

The abdomen was opened through a long upper midline incision. A large mobile tumour, 4 in. by 3 in. was found on the posterior wall of the stomach 4 in. from the pylorus and near the greater curvature. It projected both externally and into the stomach lumen. No ulcer crater was palpated in the remainder of the stomach or in the duodenum. No secondary growths were noted in the liver, and there was no glandular enlargement near the stomach.

A gastrectomy was carried out, removing three-fourths of the stomach so as to be well clear of the tumour. As soon as the vessels were ligated the blood transfusion was run as rapidly as possible. A no-loop retrocolic valved anastomosis was performed and the abdomen closed.

The operation was carried out with the greatest possible speed consistent with gentleness, both because of the poor condition of the patient and because novocain was the only available local anæsthetic.

At the conclusion of the operation pulse-rate was 72 and blood-pressure 120/70. One further pint of blood was given, making a total of 11 pints since admission some thirty hours previously. He commenced to take fluids by mouth on the evening of the operation day and apart from a lobar collapse of the right lung that later re-expanded, convalescence was uneventful. Patient was discharged as fit four weeks after admission.

REPORT ON SPECIMEN.—

Macroscopical.—A fairly firm mass arising from the stomach wall with no apparent infiltration. On section white and homogeneous, resembling lipoma. There is a central cavity filled with blood which is tracking through to the intragastric aspect of the tumour.

Microscopical (Dr. Whitwell).—The section shows a portion of stomach wall containing an encapsulated tumour. No abnormality is present in the mucous layer or the muscularis mucosæ, but the submucous layer is thickened and contains an increased number of large blood-vessels. The tumour is present in the external muscular layer, between the oblique and circular coats, and in places there is fusion of the tumour capsule and the fibrosed oblique muscle layer.

The tumour is composed of long tapering cells with dark elongated nuclei, in whorls and in some places in parallel formation. Most of the tumour is cellular, but there are areas where the stroma appears œdematous where the tumour cells are scanty and cysts and blood-vessels are frequent. Throughout the tumour are

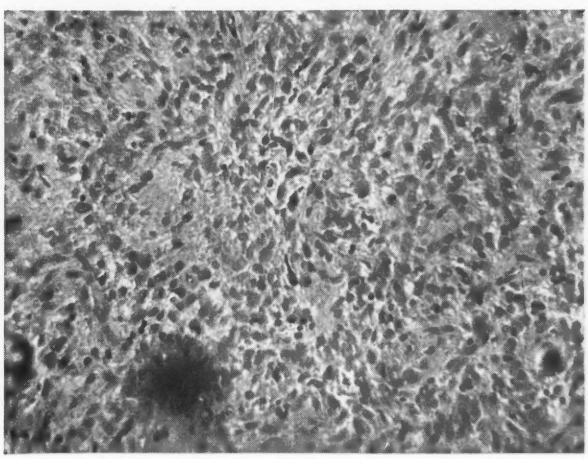

FIG. 584.—High-power view of tumour.

scattered islands of lymphocyte-like cells, sometimes in the form of perivascular cuffing. This is a typical neurinoma and shows no evidence of malignancy.

Diagnosis: Neurinoma, a benign lesion.

My thanks are due to Gen. Fettes, A.M.S. Consultant Surgeon to the Army, for permission to publish this report; to Major W. Templeton, I.M.S., Medical Specialist, for his co-operation in treating the case and for informing me of the final result; and to Dr. Whitwell for the pathological report.

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DIFFUSE SARCOMA OF THE PERITONEUM

By K. C. GREER

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DIFFUSE sarcoma of the peritoneum is an exceedingly rare condition of which the gross appearance is characteristic and striking. It must be distinguished from retroperitoneal sacroma, which is a relatively common condition.

Two types may be distinguished: the diffuse, in which the greater portion of the peritoneum is thickened; and the localized, in which a distinct localized tumour is present. Both types are closely related to the more common endothelial (mesothelial) tumours, with which they have been confused, so that in a review of the literature it is difficult to estimate the exact number of true diffuse peritoneal sarcomata which have been reported, but this would not exceed 15. The disease is characterized by a thick layer of tumour tissue, often nodular, which replaces most of the parietal and visceral peritoneum, and which is accompanied by marked ascites. Microscopically it is a spindle-cell sarcoma.

Cobb (1906) reports a case in which the omentum resembled a bath towel, forming a mass 1 in. thick. In a similar case Zacher (1924) describes the tumour mass as being nodular in places, while in others it resembles sugar-icing.

FIG. 585.—The abdominal organs in situ at autopsy.

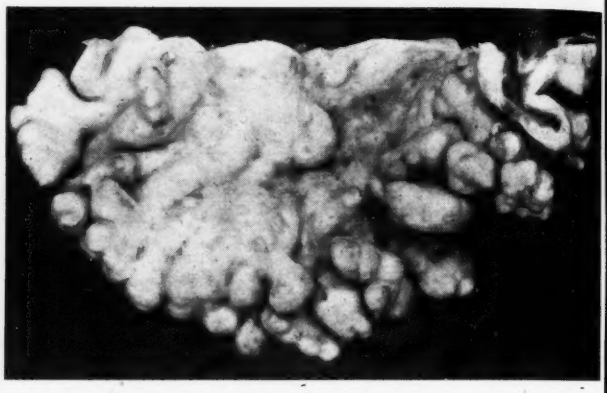

FIG. 586.—The sigmoid colon and mesocolon encased in tumour tissue

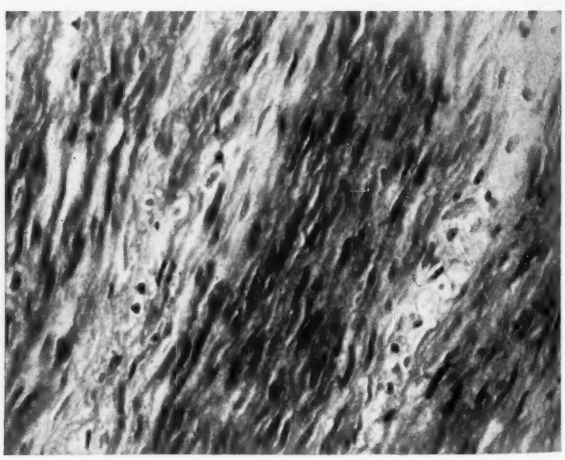

FIG. 587.—Microphotograph of tumour tissue from greater omentum. (× 245.)

CASE REPORT

HISTORY.—F. B., a white Canadian male, aged 61, was admitted to the Toronto General Hospital on April 1, 1946, with a one-year history of epigastric pain which was occasionally crampy and which gradually became more severe and persistent, accompanied by a gradual increase in the size of his abdomen. On examination the abdomen was markedly distended with fluid, and following paracentesis a large firm mass could be palpated in the left upper quadrant which extended from the costal margin to the level of the iliac crest and medially to the umbilicus. A clinical diagnosis of retroperitoneal sarcoma was made. Radiation was commenced, but the mass continued to increase in size and the clinical condition deteriorated. He died one month after admission to hospital.

AUTOPSY FINDINGS.—The peritoneal cavity contained 4000 c.c. of straw-coloured fluid containing flakes of fibrin. The greater omentum was replaced by a very large, firm, somewhat nodular, whitish mass in which the transverse colon was buried (*Fig.* 585). This was

the mass which was palpated clinically. The remainder of the colon was encased in a thick, dense tumour layer which also covered the appendices epiploicæ (*Fig.* 586). Similar tumour tissue had invaded the parietal peritoneum, lesser omentum, and mesentery. There were irregular white plaques of tumour tissue on the serous surfaces of the liver and spleen. The coils of small intestine were loosely bound together by fibrin and by a thin patchy coating of tumour tissue. On the posterior wall of the lesser sac was a soft mass, the size of an orange, of necrotic tumour tissue. No secondaries were demonstrable except in one enlarged lymph-node anterior to the hilum of the left kidney.

Careful investigation of all the abdominal and thoracic viscera failed to reveal any localized tumour from which this diffuse sheath of tissue might have originated.

MICROSCOPICAL EXAMINATION.—The tumour tissue consisted of spindle-shaped cells, closely packed together, with a moderate amount of fibrous stroma (*Fig.* 587). There was a moderate variation in size, shape, and staining properties of these cells. A moderate number contained mitotic figures and in a few places they tended to form tumour giant cells. The tumour tissue in proximity to the necrotic mass consisted of more anaplastic cells with more frequent giant cells.

The microscopical picture was typical of fibrosarcoma.

SUMMARY

A case of diffuse sarcoma of the peritoneum is reported which was characterized by a one-year history of very severe epigastric pain and ascites, and autopsy findings of a thick tunic of tumour tissue involving most of the visceral and parietal peritoneum. Microscopically the tumour was a fibrosarcoma.

I am indebted to Professor William Boyd for the opportunity of performing the autopsy on this interesting case and for his helpful criticism in the preparation of this brief case report.

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SPIGELIAN HERNIA SIMULATING ACUTE APPENDICITIS

BY DOUGLAS R. K. REID, DUNEDIN

SPIGELIAN hernia is a comparatively rare condition. River in 1942 was able to collect 112 examples from the literature, and added 4 personal cases. Paul and Hill (1943) described a very large and fatal hernia of this type, while Cotter (1946) reported 3 cases.

The hernia occurs in the Spigelian or semilunar line, most often near the level of the fold of Douglas. It is commonly of interstitial type, the parietal defect involving only the aponeuroses of transversalis and internal oblique. The neck is small, usually ½–2 cm. in diameter, and its margins are sharp and rigid. The sac lies deep to the external oblique aponeurosis and contains small bowel or omentum, although River described a case of sliding hernia of the colon of Spigelian type.

The most important aetiological factor would appear to be the existence of slit-like defects in the transversalis aponeurosis along the lateral margin of the rectus muscle ; such defects are found in the normal subject, and River suggests that they may be related to lateral perforating branches of the inferior epigastric artery. The general factors predisposing to hernia, viz. muscle wasting, childbearing, obesity, chronic cough, etc., no doubt play a part, but a congenital aspect of the lesion is emphasized by such cases as that quoted by River, in which two brothers each suffered from strangulated Spigelean hernia in the first few weeks of life. So-called pro-peritoneal lipomata have been accorded aetiological significance, but it would appear to the present writer that these represent merely secondary protrusion of extraperitoneal fat through the primary parietal defect.

Even in the presence of symptoms, many of these herniæ must escape clinical recognition owing to their small size and interstitial position. The leading symptom in most reported cases has been pain, due no doubt to the small and rigid character of the hernial orifice. A mass may be felt, but may be masked by excessive fat and by tonus of the overlying external oblique aponeurosis. Incarceration and strangulation are fairly common. The following case is reported partly because of the rarity of the lesion, and partly because of its close simulation of acute appendicitis.

CASE REPORT

An uniparous female, aged 29, was admitted to Dunedin Hospital on Dec. 12, 1947, with the diagnosis of acute appendicitis. Severe colicky pain of periumbilical distribution had commenced sixty hours previously, and had shifted to the right iliac fossa twenty-four hours before admission. There had been nausea but no vomiting, and the bowels had not opened for forty-eight hours.

On examination the patient was found to be obese, and apparently in considerable pain, although she said this was decreasing. The temperature, pulse, and respirations were normal. There was abdominal tenderness, both on direct palpation and on rebound, just above and medial to McBurney's point ; slight rigidity was present in this area, but no mass was palpated.

Operation was advised, and under open ether anæsthesia an oblique incision was made in the right iliac fossa higher and more medial than is usual. The internal oblique aponeurosis was intact, but appeared to bulge, and palpation revealed a mass deep to it. Incision of the aponeurosis exposed a hernial sac 6 cm. by 4 cm. in diameter, with a neck 3 cm. by 2 cm. The sac was covered with a thick layer of extraperitoneal fat and contained some adherent but non-strangulated omentum ; no bowel was present at the time of operation. The sac was trimmed away and the opening enlarged ; the bowel and appendix were found to be normal, and the latter

was removed. The layers of the abdominal wall were now defined and reconstituted in layers. Convalescence was uninterrupted; the patient was allowed up on the fifth post-operative day, and was discharged on the eighth day.

Comment.—The exact cause of symptoms in this case is obscure. It appears probable that bowel had been present in the sac, but had reduced itself spontaneously before or during the induction of anæsthesia. It may be said, however, that Spigelian hernia is an occasional source of pain in the iliac fossa, and is worth noting in connexion with differential diagnosis.

I am indebted to Professor F. Gordon Bell and to Dr. James Thomson, Medical Superintendent of Dunedin Hospital, for permission to record this case.

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SUBCUTANEOUS RUPTURE OF THE MUSCLES OF THE ABDOMEN

BY R. A. JAMIESON
FROM THE WESTERN INFIRMARY, GLASGOW

SUBCUTANEOUS rupture of the abdominal muscles from trauma is so uncommon that the following case is thought to be worth recording.

CASE REPORT

The patient, a powerfully built labourer of 42, was trying to move a heavy truck. He had laid hold of the back and of one side of the truck, and with his abdomen applied to the corner was thrusting with all his might. At this moment he was overtaken by a heavy trolley moving slowly, so that the left side of his abdomen was gradually but forcibly driven on to the blunt corner of the leading truck.

On admission to hospital he was found to have an oval hernia lying immediately to the left of the rectus sheath at the level of the umbilicus. The hernia could be easily reduced, but it reappeared promptly as soon as the patient moved. The overlying skin was free from bruising, but at a lower level there was some blood-staining in the groin. There was no evidence of intra-abdominal injury.

The nature of the damage to the abdominal muscles is accurately shown in the sketch by Mr. G. Donald, who was present at the operation (*Fig.* 588). The aponeurosis of the external oblique had been split in the line of its fibres, and the split extended laterally into the fleshy part of the muscle. The internal oblique and transversus had been torn across the line of their fibres, and there was an irregular tear of the peritoneum which allowed a loop of small intestine to escape into the subcutaneous fat. Bleeding had been slight. The wound was easily repaired, and convalescence was uneventful.

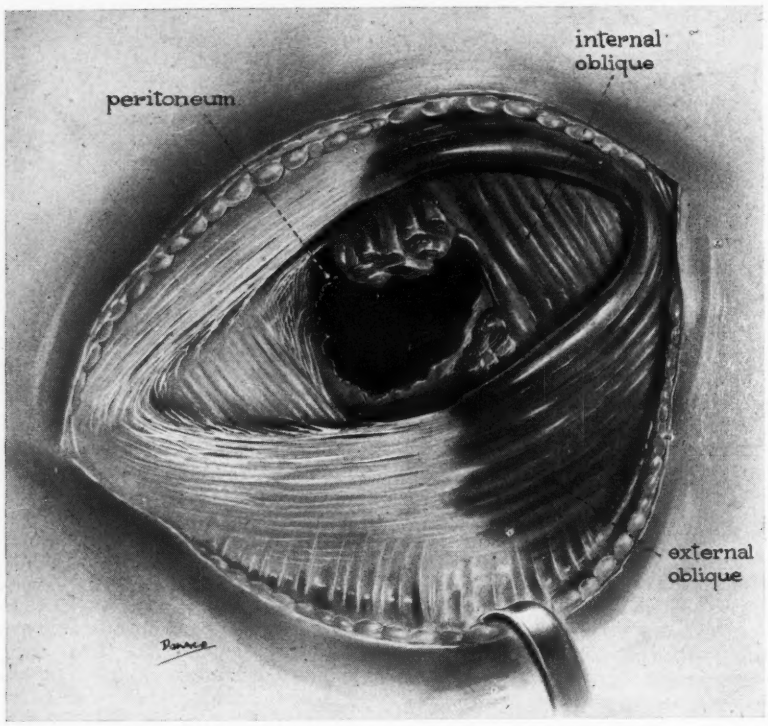

FIG. 588.—The split external oblique and internal oblique displayed after incising the skin and replacing prolapsed bowel.

Comment.—The point of chief interest in this case is the mechanism of injury. Rupture of the abdominal muscles doubtless resulted from them being forcibly thrust against an object of small size while they were tensely contracted and therefore rigid. The overlying skin and the underlying viscera escaped injury because of their elasticity.

PERFORATION OF CARCINOMA OF THE STOMACH INTO THE GENERAL PERITONEAL CAVITY

By J. P. HERDMAN, Manchester

The following case of a perforated gastric carcinoma successfully treated by primary partial gastrectomy is apparently the first one to be recorded in this country, though similar cases have been reported in the American and French literature.

CASE REPORT

F. J., a married woman of 44, first attended out-patients at Ancoats Hospital, Manchester, in July, 1943, with a history of epigastric pain about half an hour after meals, relieved by taking food and by vomiting. A diagnosis of peptic ulcer was made and confirmed by X-ray examination, which showed "a small but deep ulcer on the lesser curvature at the level of the incisura" and a possible second ulcer on the pylorus. In addition she was found to have a well-compensated mitral stenosis.

She was admitted on Aug. 21 for medical treatment. A fractional test-meal at that time showed a marked hyperchlorhydria. She responded well to diet, rest, and alkalis, and was discharged on Sept. 29, free from symptoms. A radiograph taken before discharge showed no evidence of the ulcers.

The patient had no further abdominal symptoms until a recurrence of the pain and vomiting in April, 1947. She re-attended Ancoats Hospital on July 14, and a further barium meal showed "the old ulcer fleck is still seen—at six hours it remained filled when the barium had passed through". On the next day she collapsed while at work, and was admitted six hours later to the surgical wards. At that time she presented the typical picture of a perforated peptic ulcer, with great pain and marked shock, together with abdominal rigidity and absent peristalsis. Her pulse-rate was 90, and her blood-pressure 90/65. A diagnosis of perforated peptic ulcer was made and, as a preliminary to operation, a Ryle's tube passed and an intravenous plasma drip started.

At Operation.—The abdomen was opened with a midline supra-umbilical incision under general anæsthesia (Dr. King). The peritoneal cavity contained a large quantity of greenish fluid spotted with flecks of barium. A large malignant ulcer was found in the pre-pyloric region. This was about 4 in. in diameter, and extended well up the lesser curvature, producing some constriction of the lumen of the stomach. There was a perforation ½ in. in diameter in the middle of the ulcer, with barium oozing through. A Billroth I partial gastrectomy was performed, about two-thirds of the stomach being removed. Local removal of the growth was complete, but some enlarged glands in the transverse mesocolon were left. The wound was closed without drainage. Examination of the specimen revealed that, although the size of the perforation was only ½ in., the surrounding tissue was so necrotic that a hole large enough to admit three fingers was easily made. Simple suture would therefore have almost certainly been impossible. The pathological report (Dr. Duran-Jorda) read: "Section shows carcinoma of the stomach." The patient stood the operation well. She was given a post-operative course of penicillin and sulphamethazine, and was kept on intravenous fluids until peristalsis was heard (48 hours).

After an uninterrupted recovery she was discharged on the fourteenth post-operative day. She was last seen on Feb. 23, 1948. At that time she appeared to be in excellent health. She stated that her appetite was good, and that she was gaining weight. Radiography of the chest showed no abnormality.

COMMENT

Perforated gastric carcinomata give rise to two distinct clinical pictures, a 'fulminating' identical with the familiar picture of perforated peptic ulcer, and a 'latent' of very much more gradual, and frequently painless, onset (Aird, 1935). It seems probable that the difference depends on the presence or absence of free acid in the gastric juice, rather than on the pathological nature of the growth.

The correct diagnosis is rarely made before operation, and apparently can be easily missed even then in the case of a small ulcerating carcinoma (Dickinson, 1939). For this reason some writers have advocated routine biopsy in all perforated gastric ulcers (McNealy and Hedin, 1938).

The generally accepted treatment appears to be closure of the perforation, either by sutures or by an omental graft, followed, if possible, by gastrectomy at a later date (Casberg, 1940; Hamilton Bailey, 1944; Aird, 1935; McNealy and Hedin, 1938), though primary gastric resection has also been advocated (Bisgard and Overmiller, 1944).

A survey of the figures ((*Table I*) given by the various authors suggests that primary gastrectomy has much in its favour, though of course only selected cases will have been submitted to resection.

Table I.—Operation Results in Carcinoma of Stomach

Author	Cases Treated by Simple Closure		Cases Treated by Resection	
	Total No.	No. leaving Hospital alive	Total No.	No. leaving Hospital alive
Bisgard and Overmiller	43	9	13	11
McNealy and Hedin	23	3	7	5

It is, however, significant that many of the published accounts speak of the extreme difficulty of closing the perforation, while McNealy and Hedin mention leakage from the closed perforation as having been found in many of their cases at post-mortem. It appears that the friable and necrotic edges of the growth will not hold sutures, and even if the operation appears successful, the stitches very often tear out subsequently and the perforation reopens.

Partial gastrectomy, on the other hand, offers the chance of removing the whole growth and suturing together healthy tissues. It is only applicable in the presence of a mobile growth, but if regarded as an immediate life-saving measure is not contra-indicated by the presence of secondary deposits. It has been argued that the patient's condition makes it an impractical procedure in any but a very small number of cases (Boyce, 1946). But probably the hazards of the operation have been overestimated. The majority of patients who come to operation are those of the fulminating group

with free acid and therefore relatively early growths. With modern methods of transfusion and chemotherapy, and with the advances in the technique of gastric surgery, most of these will have a chance of surviving a gastrectomy. Moreover, a successful resection will give the patient some months, and perhaps years, of comfortable life; while a successful simple closure will usually mean at best a few weeks or months of discomfort. There seems every reason, both from the point of view of the immediate and of the ultimate result, for adopting primary resection as the operation of choice in perforated gastric carcinoma.

I should like to thank Mr. McEvedy for allowing me to undertake the treatment of this case and Dr. Wilding and Dr. Duran-Jorda for the radiological and pathological reports.

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A CASE OF CARCINOMA OF THE DUODENUM

BY W. M. BEATTIE,
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AND J. D. MUIR
SURGICAL REGISTRAR, ROYAL LIVERPOOL UNITED HOSPITAL

PRIMARY carcinoma of the duodenum, particularly when it occurs in the extra-ampullary portion, is sufficiently uncommon to warrant the publication of a further case.

The incidence of the condition is quoted by Hoffman and Pack (1937) as being 0·3 per cent of all intestinal carcinomata, and in a large series of autopsies Eger (1933) estimated that the standard incidence was 0·033 per cent of all deaths. Howard (1943) found a slightly higher frequency, the standard incidence being 0·047 per cent, occurring in 1·47 per cent of intestinal carcinomata.

The commonest age incidence is in the sixth decade, with males affected three times as frequently as females. Of carcinomata of the duodenum 65 per cent are found in the ampullary portion, 19·9 per cent in the first part, and 15 per cent in the third part.

Throughout the literature the difficulties of diagnosis are stressed. Neoplasms of the first part of the duodenum simulate chronic duodenal ulceration; this occurred in a previous case which one of us (J. D. M.) encountered. Growths of the second part produce their symptomatology by involvement of the biliary system, whereas those of the third part are characterized by vomiting with or without associated pain. X-ray diagnosis is difficult before the onset of obstruction (Allen, 1938).

CASE REPORT

A male patient, W. L., aged 65, was referred to hospital on May 13, 1947, on account of persistent vomiting of three weeks' duration. An operation for a chronic duodenal ulcer had been performed in 1934; no details of this operation were available, but permanent relief of symptoms had been obtained. In 1945 a right inguinal hernia had been successfully repaired.

Vomiting was the chief feature, effortless in type, copious in amount, occurring three or four times a day and not associated with pain. The act of vomiting was preceded by severe nausea, but no precipitating factor was noted. The patient's description of the vomitus suggested that there was a delay of upwards of twenty-four hours in gastric emptying. The appetite was good and there did not appear to be any direct relationship between the type of food eaten and the onset, character, or frequency of the vomiting. Loss of weight had been progressive over the previous three months and amounted to a total loss of 15 lb. Constipation had been persistent for many years, but no recent change in bowel habits had occurred.

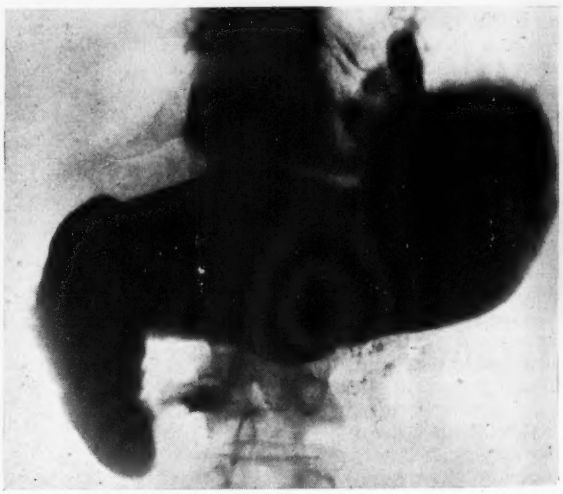

FIG. 589.—Radiographic appearance, showing obstruction to onward passage of barium at junction of second and third parts of duodenum.

ON EXAMINATION.—The patient was cachectic and dehydrated. Jaundice was absent. The abdomen showed sound upper paramedian and right inguinal scars. The stomach was visibly dilated, with occasional waves of peristalsis passing across it. The liver was enlarged to a point three finger-breadths below the costal margin and multiple hard irregular masses were palpable on its surface. Rectal examination was negative. An initial clinical diagnosis of malignant pyloric stenosis with hepatic metastases was made.

Examination of urine, fæces, and blood was normal. A fractional test-meal showed a low free and total acidity with bile and starch present throughout; blood, however, was absent. A barium meal demonstrated dilatation of the stomach and proximal duodenum up to the junction of the second and third parts of the duodenum, where there was obstruction to the onward passage of barium (*Fig.* 589). There was a large residue in the stomach and proximal duodenum after twenty-four hours.

Following these investigations the diagnosis of carcinoma of the duodenum was considered, but rejected on account of its rarity. A tentative diagnosis of carcinoma of the pancreas was made, although the absence of jaundice cast doubts upon its accuracy. At this time it was not known that a cholecystgastrostomy had been performed, although a more careful study of the radiographs might have suggested this.

AT OPERATION on May 20 a laparotomy was performed through a right upper paramedian incision. A hard mass was found obstructing the duodenum at the junction of its second and third parts, but it was not possible to be certain of its exact origin. Massive secondary deposits were present in the liver. The abdomen was closed after performing a palliative anterior gastrojejunostomy.

Following operation, the general condition deteriorated and death occurred from a terminal bronchopneumonia on May 25.

POST-MORTEM EXAMINATION.—Malignant cachexia was extreme and this in conjunction with the bronchopneumonia was presumed to be the immediate cause of death. The stomach, duodenum, pancreas, and liver were removed *en bloc* and prepared for detailed dissection. No other abnormality was found.

FIG. 590.—Duodenum opened to show macroscopical appearances of carcinoma. The ampulla of Vater is shown proximal to the neoplasm.

Dissection revealed a rounded neoplastic ulcer 1½ in. (3·65 cm.) in diameter with everted edges and a necrotic centre at the junction of the second and third parts of the duodenum (*Fig.* 590). On macroscopical section this had infiltrated the duodenal musculature, but did not involve the pancreas or peritoneum. There were numerous metastases in the liver, some subcapsular, others more deeply situated. The regional lymphatic glands did not appear to be involved and no other secondary deposits were found. The ampulla of Vater was well defined 1¼ in. (3·3 cm.) above the proximal edge of the tumour and was not involved by the neoplasm. No evidence of a duodenal ulcer was found, but the operation, which had been performed for this condition, proved to be a cholecystgastrostomy, the fistulous track of which was well epithelialized. The recent gastrojejunal anastomosis was satisfactory.

Microscopical examination showed a poorly differentiated columnar-cell adenocarcinoma with occasional polygonal-cell formation (*Fig.* 591). The hepatic metastases had a similar general structure, but the pattern was more clearly defined. The absence of glandular metastases was confirmed, together with the extent of local infiltration.

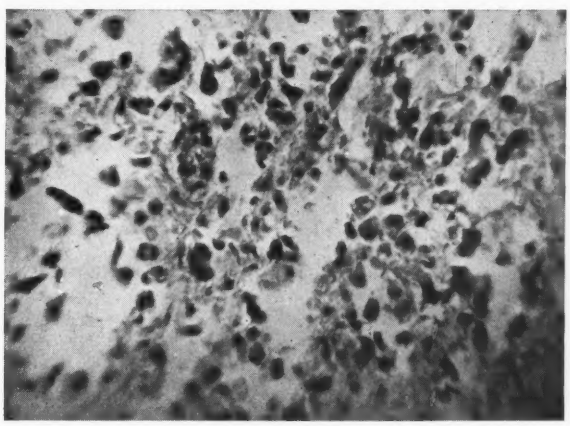

FIG. 591.—High-power microscopical view of tumour, showing poorly differentiated columnar-cell adenocarcinoma.

COMMENT

As observed by Orr and Walker (1945) many of the reported cases of duodenal carcinoma have not been critically examined. Some of the cases have probably arisen primarily from the ampullary region, others are likely to have been pancreatic neoplasms which have involved the duodenum by direct spread. There seems, however, to be no doubt that the case described is a true primary carcinoma of the duodenum. The absence of glandular metastases in an advanced carcinoma, such as this, is unusual. It is interesting to note the permanent cure of the duodenal ulcer which followed cholecystgastrostomy.

SUMMARY

A case of carcinoma of the duodenum occurring at the junction of the second and third parts is discussed.

We are grateful to Dr. R. Winston Evans and his assistants for the pathological investigations.

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PERSISTENT HÆMATURIA FROM A MINUTE PAPILLOMA OF THE RENAL PELVIS

By MAURICE SILVERSTONE, Liverpool

In the diagnosis of a case of hæmaturia an accurate history, a careful examination, and good radiographs, including retrograde and intravenous pyelograms, are necessary. In some cases a cystoscopy will have to be done during the actual attack of hæmaturia before a diagnosis can be made. Where hæmaturia is the sole symptom in the absence of any clinical signs, and the bleeding is found to be renal in origin, the possible aetiological factors that have to be considered are :—

a. Vascular : Hypertension, chronic nephritis, embolic phenomena.

b. Blood dysfunction : Purpuras, acute leukæmia, hæmophilia, scurvy, lymphadenoma.

c. Local lesions of the kidney : Angioma, papilloma, and early tuberculosis of the kidney.

The following case is reported because of the persistence of the hæmaturia for a period of time and the microscopic nature of the lesion. A similar case was reported by Anderson in 1930.

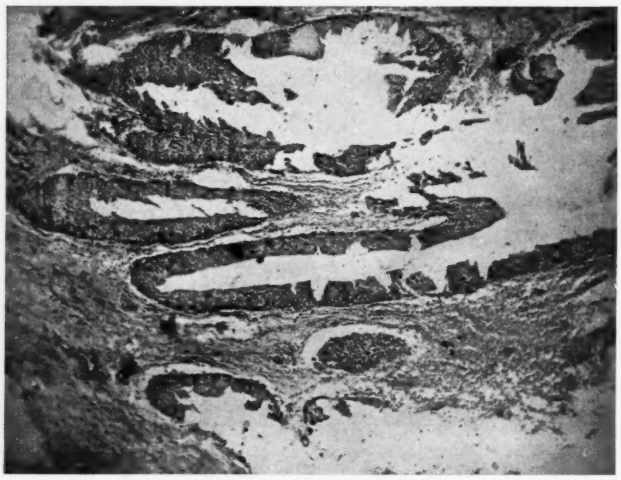

Fig. 592.—Papilloma of kidney. (Low power.)

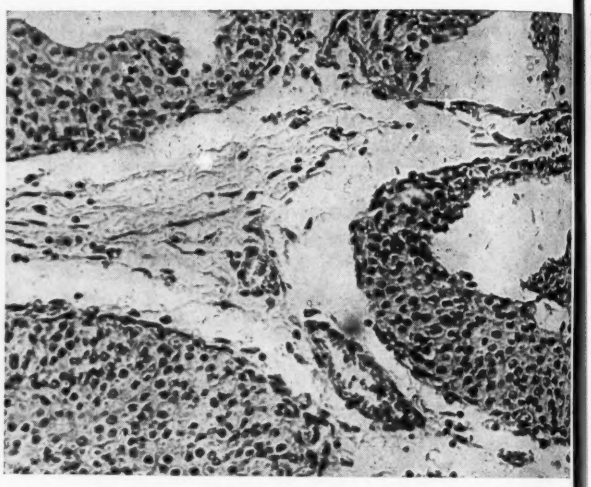

Fig. 593.—Papilloma of kidney. (High power.)

CASE REPORT

The patient, a married woman aged 28, was first seen on Sept. 30, 1941. She complained of total hæmaturia of three months' duration. There were no other urinary symptoms. There was a little dyspnœa on exertion. Her past history was uneventful; she had one child aged 3 years.

Clinical examination revealed no abnormality. Examination of her urine showed it to be heavily blood-stained, and microscopical examination revealed the presence of blood-cells and some *B. coli* ; no tubercle bacilli were found. Her blood-count showed 4,500,000 red cells, hæmoglobin 54 per cent, and platelets 268,000 per c.mm. A direct radiograph revealed no evidence of any stone. She was cystoscoped on Oct. 4 : the bladder was normal ; blood was seen coming from the left ureteric orifice. Bilateral retrograde pyelograms showed a normal kidney on each side. Intravenous pyelogram on Oct. 10 revealed normal function and outline.

She was ordered to stay in bed and was put on ascorbic acid. She was admitted to hospital on Nov. 27. The bleeding had persisted since she was first seen. Examination of her urine showed copious blood. The blood-count was as before, but the hæmoglobin was 62 per cent, the N.P.N. 38 mg. per cent, and examination for tubercle bacilli was negative.

It was decided to explore her kidney, and this was done on Nov. 29. A preliminary cystoscopy showed blood still coming down the left ureter. At operation the kidney appeared normal—it was removed. On splitting the kidney it was very disappointing to find that it was apparently normal apart from some small submucosal brown stains. These were few and about the size of a pin's head. They were scattered over the renal pelvis and in the neighbourhood of the calices, but there was a clump of these stains in the region of the upper calix. A microscopical examination taken through this area revealed a minute papilloma which must have been the cause of the bleeding. The microphotographs (*Figs.* 592, 593) show low- and high-power views of the papilloma.

Convalescence was uneventful. She was seen again in March, 1948, and was very well, doing the housework and looking after her children—she had another child three years after the operation.

COMMENT

The diagnosis in these cases is difficult. Where the hæmaturia is unilateral a local lesion in the kidney is likely to be the cause (Dukes, 1948), though a general condition cannot be automatically excluded. Jacobs (1929) reported a case of unilateral hæmaturia from a segment of a double kidney. The section of the resected segment showed chronic nephritis. To safeguard the possibility of unnecessary removal of a kidney surgical intervention should not be undertaken hastily. The patient should be repeatedly investigated at intervals of some months to make sure that the hæmaturia is

not due to some general disease, and, if possible, to make an accurate diagnosis. Surgery is indicated if the hæmorrhage is such as to endanger life or if it is repeated, is unilateral, and a general cause can be excluded. When surgical intervention is decided on, nephrectomy is the operation of choice, as only in this way can early and small lesions of the kidney be dealt with satisfactorily.

I am indebted to Dr. Hugh Smith for the pathological report.

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FATAL HÆMORRHAGE INTO A PERIRENAL LIPOSARCOMA

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As Hanley (1948), has recently pointed out, the perirenal lipoma is by no means an uncommon tumour. The unusual clinical and histological features of this case, however, make it worthy of record.

CASE REPORT

The patient, Mrs. S., aged 62, was admitted to the Ashford County Hospital on May 10, 1948. Until 4 p.m. that afternoon she had been in perfect health. After eating a plate of sandwiches she had suddenly collapsed, and on admission to hospital four hours later was in a profoundly shocked condition. Her systolic blood-pressure was below 80 mm. Hg. She was in great pain, was deathly pale, and an enormous tumour, looking like a full-term pregnancy, occupied the left side of her abdomen.

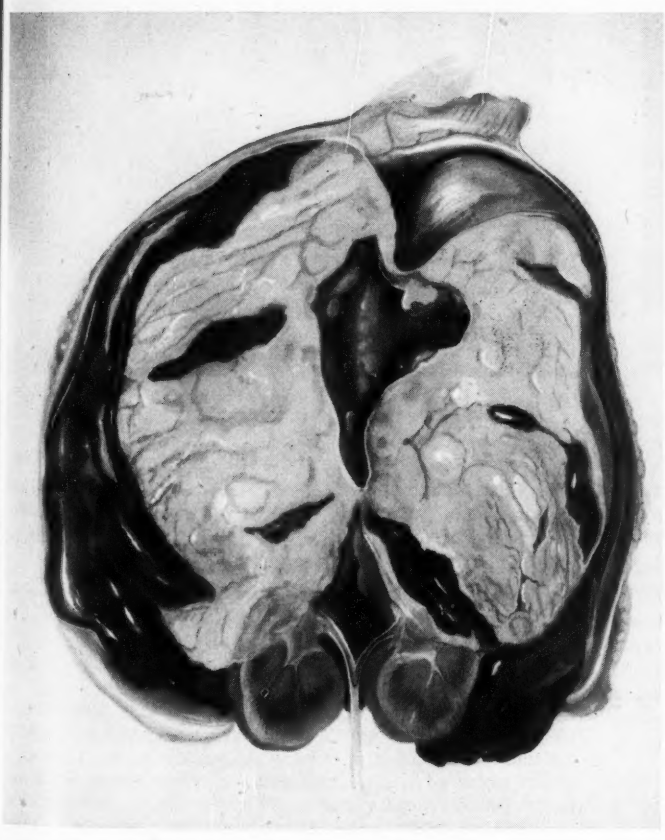

FIG. 594.—Cut surface of the specimen.

That she had had a massive hæmorrhage was obvious and a blood transfusion was started. It was soon evident that she was losing blood more rapidly than it was being given. She was hurried to the theatre, where a second transfusion was started, but her condition deteriorated rapidly and she died before any surgery could be undertaken.

At autopsy there was some free blood-stained fluid in the abdominal cavity. The liver contained multiple small secondary deposits of growth. An enormous tumour arising retroperitoneally occupied the whole left side of the abdomen and had been the subject of extensive hæmorrhage which had flooded the retroperitoneal space with blood.

The specimen consisted of a large fatty tumour with kidney attached. It appeared well encapsulated, but the capsule had been stripped into several layers by hæmorrhage. The cut surface showed soft fatty tissue. The lower half was fairly sharply demarcated from the lower half of the kidney, which was all that remained of that organ. The latter appeared normal.

A section of the tumour showed vascular well-formed adipose tissue for the most part, with a fairly sudden transition from renal to adipose tissue. In the vicinity of, and probably arising from, the moderate-sized blood-vessels were masses of plain muscle cells. The nuclei of these were very varied, but mitotic figures were absent. In the fatty part of the growth there was much hæmorrhage, and in places groups of giant cells surrounded hæmosiderin.

In the pathologist's opinion the tumour was a lipoma, the blood-vessels of which were producing a malignant growth of plain muscle (a 'lipo-angioleiomyosarcoma'). It was impossible to say whether it was of renal or extra-renal origin. Sections were sent to the Consultant Panel in Morbid Histology, who reported: "There is general agreement that the tumour consists essentially of fat and smooth muscle. Small tumours of this kind are well recognized in the cortex of the kidney, but this is much larger than usual. The vessels have dilated and death has been caused by rupture of one of them. Some of the members regard the tumour as benign, but others consider it to be of low-grade malignancy."

I am indebted to Dr. Donald Teare who performed the autopsy, and to Dr. C. F. Ross for the pathological reports.

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COINCIDENTAL STRICTURES OF ŒSOPHAGUS AND STOMACH

By ROBERT H. F. BRAIN

FROM THE DEPARTMENT OF SURGERY, UNIVERSITY OF BIRMINGHAM

STRICTURES of the œsophagus resulting from the accidental or intentional swallowing of corrosives, are unusual; co-incidental stricture of the stomach is rare. One was reported by Vincent and Hartman of the Mayo clinic in 1925; and in 1935 Sagar and Jenkins described a case of œsophageal stenosis and in the pre-pyloric region, were seen. On subsequent examination, these two areas quite naturally had sustained the maximum damage. Other interesting points in the literature are that acids are more likely to damage the stomach, and alkalis the œsophagus, and that carcinomatous change

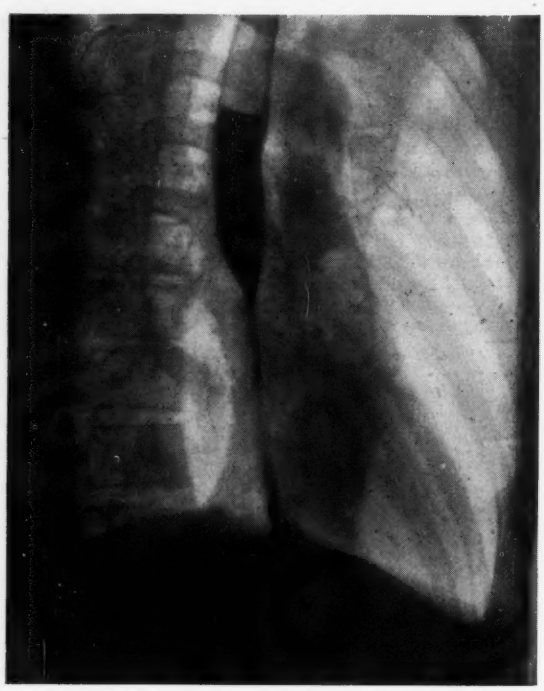

FIG. 595.—Radiograph taken Nov. 31, 1947, showing œsophageal stricture.

FIG. 596.—Radiograph taken Jan. 15, 1948, showing barium pool in stomach.

together with hour-glass constriction of the stomach, but this was the result of simple peptic ulceration.

Stricture formation in the stomach following the ingestion of corrosives without the involvement of the œsophagus is also recorded—by Vincent and Harrington in 1939, and by Schulenburg in 1941, these being in the American and English literature respectively, while in the foreign medical press, particularly that of the Russian, there are several other references. Orator in 1929 collected 34 cases and Petrov in 1935 noted 41 operations for similar conditions. Yudin, writing on the surgical construction of 80 cases of artificial œosphagus, states that the stomach has often been burnt by the caustic soda along with the œsophagus, in some cases the damage being sufficiently severe to produce a total and irreparable loss.

In considering the aetiology of the sites of stricture formation, the experimental findings of Testa in 1938 are interesting. A little caustic soda, mixed with barium, was introduced into the œsophagus of dogs, its passage being observed by the X-ray screen. Zones of spasm at two main points, immediately above the œsophageal hiatus, in corrosive strictures appears to be high. This was stressed by Benedict in 1941, who published 33 cases of carcinoma developing in benign lesions, of which 16 were known to have followed corrosive burns.

The following example of simultaneous corrosive stricture of œsophagus and stomach is one of the few reported in the English literature.

CASE REPORT

A man, an architect, aged 48 years, was admitted to the Surgical Professorial Unit at the Queen Elizabeth Hospital under Mr. A. L. d'Abreu on Nov. 19, 1947, complaining of retrosternal and abdominal pain, difficulty in swallowing, and vomiting of three weeks' duration.

One month before admission he had attempted suicide by drinking one-third of a cupful of strong household ammonia solution. He suffered immediate, severe retrosternal and epigastric pain, and vomited several times accompanied by numerous small, bright-red hæmorrhages. He received no immediate treatment, and during the next few days his symptoms gradually subsided, and he was able to swallow first liquids and later solids. However, during the next two weeks he experienced progressive difficulty in swallowing, first, solids, and later liquids. He suffered pain beneath the

lower end of the sternum, and felt a sensation of food "being pushed through a restricted orifice". This happened within 10 minutes of eating, and was subsequently followed by vomiting.

ON ADMISSION.—His general condition was good, and physical signs were absent. He could take fluids only, and that with occasional bouts of vomiting. On Nov. 25 he was œsophagoscoped by Mr. d'Abreu and at 31 cm. from the incisor teeth a stricture was seen about 2·5 cm. in length. Gum-elastic bougies, sizes 9 to 15, were passed under direct vision.

Progress following this dilatation was rapid in that he could swallow with decreasing discomfort, and within three days he was able to take semi-solids. He was dilated again under direct vision on Nov. 31. A radiograph following a barium swallow at this time showed a long, tubular stricture involving the lower third of the œsophagus (*Fig.* 595), though there was no 'hold-up' to either fluid or semi-solid medium (*Fig.* 595).

PROGRESS.—He was discharged from hospital on Dec. 22 much improved, although during his last week in hospital he had been complaining of mild abdominal discomfort after meals.

He returned home for the next two weeks, and was then admitted to the Warwick Mental Hospital as a voluntary patient. During this period his abdominal discomfort following meals gradually increased, and vomiting recommenced, occurring usually every two to three days, in considerable amounts. Coincidentally with these symptoms, his general health deteriorated.

ON RE-ADMISSION.—He was re-admitted to the Queen Elizabeth Hospital on Jan. 15, 1948, as a very despondent and pessimistic individual who had obviously lost a good deal of weight and was considerably dehydrated. Examination at this time revealed all the classical, physical, and radiographic signs of pyloric stenosis, and the X-ray report (*Fig.* 596) states—"no delay in transit of liquid barium through the œsophagus, but once in the stomach, it fell into an enormous pool of accumulated gastric juice, the pyloro-duodenal area being not visualized". Investigations at this time showed a normal blood-count and plasma biochemistry, and he was treated by gastric lavage, and by oral and rectal fluids.

AT OPERATION.—A tubular stricture involving 1½ in. of the prepyloric region was found. The stomach wall in this region was ½ in. thick, and very œdematous; this, coupled with the fact that the upper jejunum was contracted, made the posterior iso-peristaltic gastro-enterostomy which was performed a difficult procedure.

PROGRESS.—Following operation, he was treated for the next three days by continuous gastric suction and intravenous fluids. During this time, his general condition gave rise to considerable anxiety, mainly because of prolonged operative shock. However, he steadily improved in spite of developing hypostatic pneumonia, recovery from which was assisted by systemic penicillin. Thereafter, his progress was satisfactory, his only setback being a severe bout of diarrhœa which commenced on his tenth post-operative day and lasted for a further three days.

During his final week in hospital, he was taught to pass on himself a Hurst's mercury bougie, size 20, its complete passage through the œsophageal stricture being demonstrated by X rays (*Fig.* 597). He was discharged to a convalescent home on Feb. 15, complete with his own bougie.

Since then he has been followed-up at monthly intervals, and when last seen on April 20 he had put on 4 st. in weight, was completely symptom-free, and has now resumed his occupation. He passes his bougie regularly at roughly 10-day intervals.

SUMMARY

A further case is recorded of double stricture of the œsophagus and stomach following ingestion of a strong corrosive—in this instance, household ammonia. Comment is made on the time lag of two months between his admission with œsophageal obstruction and that with prepyloric occlusion. Previous records have also noted that such coincidental strictures are usually the result of the swallowing of large quantities of the corrosive. In this case, it must be noted that only one-third of a cupful, that is, between 1 and 2 oz., had been swallowed.

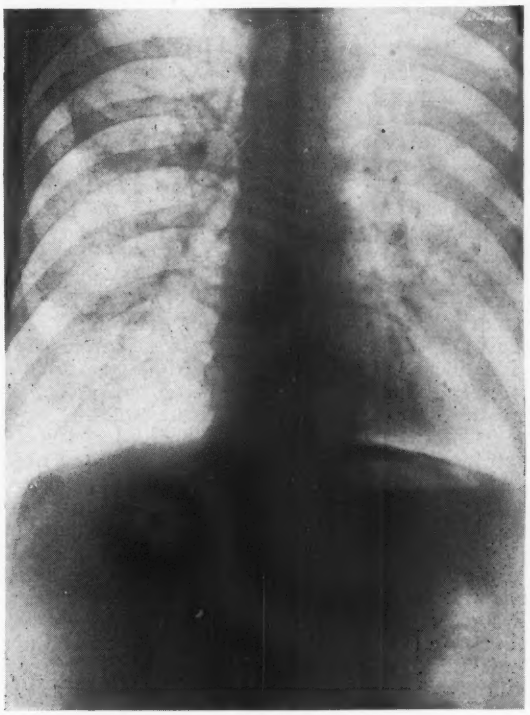

FIG. 597.—Radiograph showing bougie having passed the œsophageal stricture.

Lastly, the conclusions of the experiments by Testa (1938) are well illustrated here, in that the stricture formation appears to have occurred immediately proximal to the original areas of spasm.

I wish to thank Mr. A. L. d'Abreu of the Professorial Unit, Queen Elizabeth Hospital, Birmingham, for permission to publish this case, and for allowing me to assist in its treatment; and to Professor F. A. R. Stammers for his criticism and help in the preparation of the paper.

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REVIEWS AND NOTICES OF BOOKS

Identification of Tumours. Essential Gross and Microscopic Pathologic Features systematically arranged for Easier Identification. By N. CHANDLER FOOT, M.D., Professor of Surgical Pathology, Cornell University Medical College; etc. 6 × 9 in. Pp. 397 + xx, with 241 illustrations. 1948. Philadelphia and London: J. B. Lippincott Co. 36s. net.

"Where can I find out about a certain tumour without having to search through a long treatise on neoplasms or an even thicker book on general pathology?"

This question has been put so often to Professor Foot by students and clinicians that, possibly to some extent in self-defence, he has written this handbook. After reading it we have nothing but praise for its accuracy and commendable conciseness, the attractive trans-atlantic style in which it is written, and the excellence of its many illustrations. The book is, nevertheless, what its author professes it to be—"a brief guide to the identity of tumours". The publishers describe it on the jacket as "a quick reference ideally suited for use by the student, pathologist, surgeon, or practitioner". Its contents are "pared down to the essentials necessary for the identification and diagnosis of a given tumour". We are reminded that "for the amateur naturalist there are practical guides to birds, butterflies, moths, flowers, trees, and ferns" which "enable the reader to identify a given bird, butterfly, and so on as readily and quickly as possible" and the author can see no reason why "a somewhat similar ready reference should not be compiled for use in the diagnosis of tumours". It is quite clear that the book has been written to guide the reader whilst actually examining sections of a tumour from a living patient who may be suffering from a mortal disease.

If some means could be devised whereby the use of the book could be strictly limited to undergraduate students during their training in pathology, when the identification of tumours is purely an academic exercise, we should have little serious criticism to offer. We find it difficult, however, to dismiss the possibility that the inexperienced post-graduate may be encouraged or even tempted to misuse it. The full significance to the patient and his surgeon of the complex histological pictures met with in tumour pathology cannot be learned from this or any other book. Long experience in handling morbid material, and the study of its structure under close expert supervision, is the only training which fits a man to accept the serious responsibility of tumour diagnosis. This is the hard road which Professor Foot himself has trod and thereby gained an international reputation. We believe that the incautious or over-confident reader will be persuaded that there is a short cut to proficiency in this responsible branch of diagnostic pathology. This is dangerous.

Atlas of Human Anatomy, Descriptive and Regional By M. W. WOERDEMAN, M.D., Professor of Anatomy and Embryology in the University of Amsterdam. Volume I, **Osteology, Arthrology and Myology.** 1948. Amsterdam: Wetenschappelijke Uitgeverij.

BOOKS on anatomy are legion and every country in the world produces its own books on this subject, but to-day there is an increasing scarcity in many countries of anatomical material and this includes the British Isles. Therefore the modern student, of necessity, is going to rely more and more on text-books for his knowledge of descriptive and regional anatomy.

The first volume of Professor Woerdeman's work is devoted to osteology, arthrology, and myology, and the illustrations are remarkably good. Some of them are original and do give the student an excellent idea of dissections which are rarely seen in the dissecting room. The illustrations of muscles are truly excellent and give the reader a very good idea not only of the attachment of the muscles but also of their connexions. This is one of the really useful books on anatomy and should be in every anatomical library and dissecting room. We look forward to seeing the future volumes of this work as they appear. A first-class production.

Physics and the Surgeon. By H. S. SOUTTAR D.M., M.Ch. (Oxon.), F.R.C.S. (Eng.), Hon. M.D. (Trinity College, Dublin), Hon. F.R.A.C.S., Consulting Surgeon, London Hospital. Being No. 48, *American Lecture Series.* 5½ × 8½ in. Pp. 60 + viii, with 41 illustrations. 1948. Oxford: Blackwell Scientific Publications Ltd. 7s. 6d.

THIS small monograph has much in it which will appeal to the medical reader. Mr. Souttar, who delivered the Bradshaw Lecture at the Royal College of Surgeons on the same subject, has always enjoyed a keen interest in mathematics and physics. No one could have written such an interesting volume, dealing as it does, with human mechanics, electrotherapy, and radio-activity, unless he himself was a master of physics.

The Treatment of Acute Compound Injuries of the Spinal Cord due to Missiles. By DONALD D. MATSON, M.D. Being No. 23, *American Lecture Series.* 5½ × 8½ in. Pp. 64 + viii, with 12 illustrations. 1948. Springfield, Ill.: C. C. Thomas. (Oxford: Blackwell.) 9s. 6d. net.

THIS small handsomely bound monograph is devoted to the treatment of spinal cord injuries due to missiles of war. It is written in a lucid and easy style covering all the essential ground that a surgeon requires to know. First-aid treatment, the neurological examination, lumbar puncture, the indications for early laminectomy, spinal cord concussion, and post-operative care are all admirably covered.

An excellent monograph giving the results of treatment of spinal cord injury in the American Army in World War II. It should be read by all neurosurgeons as the book is packed with sound practical information.

Anæsthesia for the Poor Risk. By WILLIAM W. MUSHIN, M.A. (Oxon), M.B., B.S., F.F.A., R.C.S., D.A., Director, Department of Anæsthetics, Welsh National School of Medicine, Cardiff; formerly First Assistant, Nuffield Department of Anæsthetics, University of Oxford. Being No. 49, *American Lecture Series.* 5 × 8 in. Pp. 74. 1948. Oxford: Blackwell Scientific Publications Ltd. 7s. 6d.

"ON October 16th, 1846, in this room, then the operating theatre of the hospital, was given the first public demonstration of anæsthesia to the extent of producing insensibility to pain during a serious surgical operation. Sulphuric ether was administered by William Thomas Green Morton, a Boston dentist.

"The patient was Gilbert Abbott, the operation was the removal of a tumour under the jaw. The surgeon was John Collins Warren.

"The patient declared he had felt no pain during the operation and was discharged well, December 7th.

"Knowledge of this discovery spread from this room throughout the civilised world and a new era of surgery began."

The visitor to the Massachusetts General Hospital is proudly taken by his guide up the stair to the ' dome ', and outside the room at the top he will see the above engraved on a marble slab. It is indeed an epitaph for which patients and surgeons have reason to be profoundly grateful.

The purist might object that it is not strictly true, as a ' soporific sponge ' had been used through the ages to blot out the pain of surgical procedures.

This discovery, however, achieved more than the mere obliteration of pain. It enabled speed in surgical operations to become an accomplishment and no longer an aim. It was this fact which ensured a new era in surgery.

The author of this series of essays on anæsthesia must be congratulated on having provided a book, the sentiments of which will be echoed by every surgeon and anæsthetist from the dedication to the last word. How much easier would it be to keep abreast of the modern spate of papers in scientific journals if more experts would crystallize them like this.

There are in all twenty-eight essays, each illustrating some particular aspect of modern anæsthesia, fully documented so that the curious can consult the originals.

They can almost be reduced to a series of anæsthetic aphorisms :—

" The anæsthetic depends on the patient and not the disease."

" Not what anæsthetic should I give but what can I do to safeguard the patient from sequelæ peculiar to the illness."

" Give what you are used to."

" Anæsthesia is a state between life and death."

" The basic principles of safe anæsthesia still hold good, a good airway, adequate oxygen, and a level of anæsthesia which is not deeper than that required for the operation."

" The safety of curare and pentothal lies with the skill of the administrator."

" The introduction of something new need not be the sign to discard all that is old."

These essays touch on most of the controversial points of modern anæsthesia, not merely those which interest the specialist anæsthetist, but also those which are of vital importance to the surgeon, such as convulsion during anæsthesia, anæsthesia for operations on various regions, curare, reviving the dead, post-operative chests.

A plea is rightly made for the anæsthetist to have an assistant in the theatre, and in this way the tragedy of " the wrong cylinder " might be still more definitely prevented.

In a small book such as this the historical aspect of anæsthesia can be hardly mentioned. It was fully illustrated and surveyed in 1946 in the wonderful exhibition " Before and after Morton " arranged at the Wellcome Historical Medical Museum, by the Director, Dr. E. Ashworth Underwood, to celebrate the centenary of Morton's demonstration.

It is to be hoped that there will always be some exhibition in the Museum's new premises, small and meagre though they are, when compared with the original conception of the founder, to interest and educate medical men and women.

The author does make a subtle reference to the history of surgery when he uses the word " obtund " in the sense of " to deaden " (p. 41). He writes, " Warning, that care must be taken to obtund sensation ". The word was used in the English translation made about 1400 of Lanfranc's *Chirurgia Magna*, which was written in 1296, and again by Dr. Johnson in No. 78 of *The Rambler* (1750), when he writes : " No man can at pleasure obtund or invigorate his senses." Perhaps Dr. Johnson was wrong!

The word ' anæsthesia ' is not modern nor was it invented by Oliver Wendell Holmes. It was used by Dioscorides and by Plato. Great Britain did play some part in the discovery of anæsthesia. Credit must be given to Humphrey Davy, who had the idea, and Hickman, who put it into practice, though fortunately his state of " suspended animation " has, it is hoped, now disappeared for ever from anæsthetic practice.

Some may wish to give the credit of the discovery of anæsthesia to Esdaile or Elliotson, who operated upon patients in a hypnotic state, or to Wells, or Crawford Long. There are monuments to both of the latter as the discoverers of anæsthesia in their native towns of the U.S.A. However, the credit must be given to Morton, as in the words of Francis Darwin, " In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs ", and Morton convinced the world.

The first account of Morton's procedure was given by Dr. Henry J. Bigelow in the issue of *The Boston Medical and Surgical Journal* of Nov. 18, 1846, and in that of Dec. 9, 1846, Dr. J. Collins Warren gave an account of the operation he performed on Gilbert Abbott.

If a new era of surgery began on Oct. 16, 1846, modern anæsthesia has also opened new eras in thoracic and neurosurgery. The words of Henry Jacob Bigelow, after witnessing the first operation, were indeed true : " Gentlemen, this is no humbug. I have seen something that will make its way round the world."

The book should be possessed by all surgeons and anæsthetists and be in every hospital library for the resident to study.

Handbook of Surgery. By ERIC C. MEKIE, F.R.C.S., and IAN MACKENZIE, M.B.E., F.R.C.S. Second edition. 5 × 7½ in. Pp. 764 + xvi. 1949. Edinburgh : E. & S. Livingstone Ltd. 20s. net.

THE second edition of this handbook bears the name of Ian Mackenzie as joint author, and brings yet more of the standard Edinburgh teaching into the book.

As a handbook this small volume is just what the student wants, for it gives in a clear, dogmatic style the essentials that are required to pass the surgical finals.

The book is well printed, but it is a pity that so few illustrations, twenty-nine in all, have been used, for the ones that are in the book are excellent.

Hæmostatic Agents. By WALTER H. SEEGERS, M.S., Ph.D., Professor of Physiology, Wayne University College of Medicine, Detroit, Mich., and ELWOOD A. SHARP, M.D., Sc.D., Director, Department of Clinical Investigation, Parke Davis & Co. ; Lecturer, Department of Medicine, Wayne University College of Medicine, Detroit, Mich. 6 × 9 in. Pp. 131 + xii, with 27 illustrations. 1948. Springfield, Ill. : C. C. Thomas. (Oxford : Blackwell.) 25s. net.

THIS book contains a great deal of information about the details of preparation and the value in surgery of preparations of thrombin, fibrinogen, fibrin foam, gelatin sponge, and oxidized cellulose as local hæmostatics. Careful preparation, together with the preservation at an optimum of various basic physical properties of all these substances, would appear to be the key to success, and it is clear that a great deal of patient research is necessary before the ideal local hæmostatic is found. The first and introductory chapter of the book is devoted to a close discussion of the factors concerned in blood-clotting. It will be read with profit by those already familiar with the general pattern of modern research into this largely unsolved problem. As a practical guide to surgeons the book is of unquestionable value, but many of the successes claimed for these substances in the control of bleeding need confirmation by trial on far larger series of cases than those reported.

Nouveau Précis de Pathologie chirurgicale. By J. PATEL (Editorial Secretary), J.-P. CALVET, J. CAUCHOIX, R. COUVELAIRE, J. GOSSET, J. HEPP, L. LEGER, P. MALLET-GUY, J. MATHEY, R. MERLE D'AUBIGNÉ, A. MOUCHET, P. PETIT, V. VEAU, M. ARNAUD, H. BONNET, and J. DELARNE. To be issued in six volumes. $6\frac{1}{2} \times 8\frac{3}{8}$ in. Vol. I, Pathologie général; Pathologie tissulaire générale; Affections des Membres et des Ceintures. Pp. 687 + viii, with 309 illustrations. Vol. II, Affections des Membres et des Ceintures (suite). Pp. 620 + viii, with 356 illustrations. 1947. Paris: Masson et Cie. Vol. I, 1500 fr.; Vol. II, 1300 fr.

THESE are two further volumes in a series of six, of which Volumes III and VI have already been reviewed (1948). Like the preceding volumes, they suffer to some extent from poor quality paper, which has interfered with the reproduction of some of the photographs: the quality of most of the radiographs is fairly good.

Though much of the work is taken up by surgical pathology, the clinical aspects and principles of treatment of the conditions described are also outlined, although not in so much detail. There are no references to the literature, although authors' names, mostly French, are frequently referred to.

Volume I introduces the subject of general pathology and describes the pathology of the neurovascular system and the effects of injury to the upper and lower limb.

Professor Henri Bonnet, of Paris, describes generalized infections on orthodox lines: the distinction between woody tongue of cattle and actinomycosis is ill defined, and the theory of infection by sucking straws is still given: penicillin is only mentioned briefly.

Dr. Jean Gosset, of Paris, gives a good account of the complications of injury and burns, but says little on the subject of skin-grafting.

Vascular diseases receive a long section of some 140 pages by Professor Mallet-Guy, of Lyons: this is largely based on the work of Leriche, and is profusely illustrated with good arteriograms and phlebograms. Ten pages are given to consideration of arteriovenous fistula alone, and the whole section will repay careful study.

Dr. Jean Gosset, of Paris, gives an up-to-date account of injuries and abnormalities of peripheral nerves; but it is remarkable that the use of nerve transplants from the sciatic of a dog should be advocated.

Injuries to the limbs take up the remainder of the volume, described by Professor Merle D'Aubigné and Dr. J. Lance. The mechanism and effects of injury are thoroughly described and well illustrated by diagrams and radiographs: treatment is summarized with few details of technique, but the methods mostly conform to standard British practice and there are several quotations from Watson-Jones. The authors advocate Küntscher's intramedullary nails for non-union of the humerus and femur.

Volume II is entirely devoted to orthopædic surgery, and is the work of Drs. Jean Cauchoix and P. Petit, of Paris. The volume is divided into three main sections, acquired abnormalities of the locomotor system, regional pathology, and congenital abnormalities.

On the subject of acute hæmatogenous osteomyelitis, the author admits to as yet little experience of penicillin, and favours diaphysectomy if the infection fails to respond to simple drainage. Dystrophies and tumours of bone and the pathology of joints are thoroughly described.

Regional pathology includes vascular as well as purely orthopædic conditions: aneurysms of the hand and of the axillary and femoral vessels receive special consideration. The author strongly recommends excision of a length of axillary vein in the treatment of axillary thrombophlebitis, on the same principle as the treatment of arterial spasm following injury. Anticoagulants are not mentioned. The surgical pathology of all the common and many most uncommon lesions is dealt with in detail, particularly lesions of the hip and knee.

The section on congenital abnormalities is most informative, particularly the long chapters on congenital dislocation of the hip and talipes.

These volumes make a valuable work of reference in surgical pathology for the postgraduate student, but many of the treatments described are not quite up to date and a few of the methods are unfamiliar to the British reader.

The Selected Writings of William Clowes, 1544-1604. Edited, with an Introduction and Notes, by F. N. L. POYNTER, B.A., F.L.A. (Wellcome Historical Medical Museum). $4\frac{3}{4} \times 7\frac{3}{8}$ in. Pp. 179, with 8 plates. 1948. London: Harvey & Blythe Ltd. 15s. net.

MESSRS. Harvey & Blythe have inaugurated their new *Masters of Medicine* series with a volume small in size but rich in attractive content, and in Mr. Poynter they have found an editor who has brought the true *Avril* touch of a Hilaire Belloc to his account of the springtime of English surgery.

William Clowes, the subject of this first volume in the series, was the companion of such men as Vicary, Banester, and Gale, all of whom, like their greater contemporary, Ambroise Paré, across the Channel, had learned and developed their practice of surgery on the field of battle. Men of action, Mr. Poynter would have it, are notoriously uncommunicative; with a score of memoirs of recent leaders in battle, from Foch to Eisenhower, facing us on our own bookshelves, we might question his general assertion, whilst freely agreeing that had these pioneers of surgery not committed their professional experience to print we should know but little of them to-day. For it is from the self-revelation of the man as set down in his own writings that this picture of the practitioner in the teeming life of Elizabethan London, its Court, its soldiery, its merchants, and its playhouses, has been given us, and we have full reason to be thankful for the gift.

Clowes, a Warwickshire man of old yeoman stock, was born in 1544. That was the year after the publication of Vesalius' *Fabrica*, the true foundation-stone of modern surgical practice. Admitted to the Barber-Surgeons' Company in his early teens, he was apprenticed to Master George Kemble, to whom in later years he was to tender public thanks "for giving me the first light and knowledge of this noble art of surgery". Such light and knowledge differed but little from that afforded to John of Arderne two centuries before, save for the knowledge of anatomy gained from Caius' lectures at the Surgeons' Hall and from Udall's translation of Vesalius's text. His period of apprenticeship served, he went, a stripling surgeon of nineteen years, with Warwick's ill-fated expedition to Normandy, bearing with him a well-filled chest emblazoned with the Bear and Ragged Staff of Warwick's arms. There, tending the troops locked up in Le Havre, he made his first acquaintance with plague and scurvy, and began his life-long friendship with the older John Banester, "whose counsell unto me was always very profitable". On his return to England he continued to serve as ship's surgeon for a number of years at Portsmouth, until appointed assistant surgeon to St. Bartholomew's Hospital in the city. Here, although only a junior on the staff, his name is found heading the four responsible for the posthumous edition of Vicary's *Profitable Treatise* (1577), for which he had written the Epistle Dedicatory to the Governors of the Hospital. At Bart.'s he found that "amongst every twenty diseased persons that were taken in, ten of these had the pox". From the experience gained there and amongst the sailors at Portsmouth, he wrote his *Brief and Necessarie Treatise* on the cure of

the *morbus gallicus*, to the success of which may be attributed his securing the grant, by Royal request, of the Bishop's Licence. From now on he was one of "the Queen's men", and as such obeyed her behest to leave his civilian post in London to serve with Leicester's forces in the Low Countries. To these men of 1586, under Leicester's command, the names of Arnhem and Nijmegen were as familiar as they have become to us of a later day, and here, as a sixteenth-century leader of commando, the gallant Sidney received his fatal wound. From this campaign Clowes was recalled to England to act as Surgeon to the Fleet then preparing to meet the Armada, eventually sailing into action on board Howard's flagship, the *Ark Royal*. The Armada dispersed, he returned to London "one of the Queen's Chirurgeons", a man of great experience "both by land and sea", in his forty-fourth year in the front rank of his profession, and a Member of the Council of the Company. His *Prooved Practise*, published during his absence in Holland in 1588, had been so successful that a new edition was needed in 1591. He was now a full "Master of the Mystery" and an Examiner in Surgery. Five years later appeared the third edition of the *Practise*, his last and best book; soon afterwards he retired to country practice at Plaistow in Essex, where, a few short years later, he was to die of the plague.

Like Paré, Clowes, too, had to defend his action in writing in the vernacular, against "that vain cavill of publishing books in English". He wrote for a youth that had little Latin and less Greek, in the language of his own people, of their poets and playwrights, rejoicing in the dawn of England's Renaissance. From the many fascinating excerpts selected for our pleasure by Mr. Poynton, Clowes appears as no rough-and-ready sawbones, but as a conscientious surgeon well abreast of the knowledge of his day. The echoes of Paracelsus' denunciation of the obdurate Galenists of the Continental schools had reached England, and Clowes' reaction to their wordy warfare is characteristic of one whose primary interest is the welfare of his patient: "If I find either by reason or experience anything that may be to the good of the patients, and better increase of my knowledge and skill in the art of surgery, be it in either Galen or Paracelsus, yea, Turk, Jew, or any other infidel, I will not refuse it, but be thankful to God for the same." He was as familiar with contemporary authors as any man could be in that day of infrequent books: Vesalius, Paré, Chauliac, Vigo, Guillemeau, are names frequently referred to in his text.

Mr. Poynton has given us here the portrait of a man zealous for the honour of his calling, and scornful of those "wandering runagate rogues" who prey upon the ignorance of the patient, "unclean birds" against whom he warns his readers for their own safety. In his *Prooved Practise* (from which the majority of the editor's selections have been taken) one finds, not a formal treatise, but a highly individual record of personal experience "not to be passed slightly over, or buried in forgetfulness". The resurrection of these pages from the libraries will prove a source of deep pleasure to any reader, lay or surgical, who has a particle of historical sense in his composition.

Joseph Lister: The Friend of Man. By HECTOR CHARLES CAMERON. $5\frac{1}{2} \times 8\frac{1}{2}$ in. Pp. 180, with 12 illustrations and a facsimile letter from Lord Lister. 1948. London: Heinemann Medical Books Ltd. 17s. 6d.

To many who will have read this biography its perusal must have revived memories of the B.M.A. Meeting at Edinburgh in 1927, at which the leaders of surgery in two continents celebrated the hundredth anniversary of Lister's birth. Most of the speakers on that occasion have since gone on to join "the Chief" in the shades, but to one insignificant listener in that throng the outstanding recollection abides of Harvey Cushing's address, with its vivid comparison of Lister and Lincoln: two men who had walked uprightly, worked righteousness, and spoken the truth that was in their hearts. Faith each had, and conviction, helping the one to free mankind from the shackles of sepsis as they helped the other to free men from the shackles of slavery. With malice towards none, with charity for all, each had striven to heal the people's wounds. "Though lives die"—thus rang Cushing's peroration—"the life is not dead, and the memory of lives such as theirs will be reverently and forever shared by the universal brotherhood of man."

Lister can never pass out of our memory. Though dead, he still goes on healing so long as we practise our craft, made safe by his life-work. He is one of our Immortals. Of his private assistants—Hector Clare Cameron at Glasgow, John Bishop at Edinburgh, Rickman Godlee and Watson Cheyne at London—Bishop died too soon to leave any written record of his master. Godlee's great biography will always remain the standard account, comparable in authority and treatment with Valléry-Radot's life of Pasteur. Both Cameron and Watson Cheyne have told the story of the evolution of wound treatment, and "each who told it added something new". But these, with Leeper and Stewart, were writing for an instructed public from within the inner circle of colleagues and assistants who had taken an active part in the long tale of experiments, of patience under disappointment, and of ultimate triumph in physiological research. They have painted, unforgettably, the portrait of the scientist who, in Lucas-Championnière's words, "succeeded in determining the general laws of repair".

All this the younger Cameron now re-tells, in easy non-technical narration for the non-technical general reader, and in the telling he adds fresh fragrance to a twice-told tale. As the son of the elder Cameron, who had been known to the small band of Lister's assistants as "the beloved disciple", he writes from memories of a youth spent in the intimacy of two firesides, his memory enriched by his father's preservation of all the correspondence that had passed between the two elder men over a long period of years. He has known Glasgow intimately—even to its more than five and seventy separate stenches—Edinburgh and London no less well, and in each successive scene he sets his subject, portraying him with no spoiling touch of hero-worship. Thus he depicts a very human Lister, whose lack of method and unpunctuality could be a sore trial to those who had to wait upon him; one whose occasional flashes of hot temper could betray his Quaker upbringing, and whose unfailing gentleness with children went hand in hand with his frank enjoyment of his students' applause. In no feature is his portrayal more sensitive than in his depiction of Lister's complete dependence on his wife. Few men have ever known a more wonderful helpmeet. They were assuredly John Brown's "dear two—made for each other, and for our good". The tragedy of her sudden loss at Rapallo left him solitary, lonely, and weary, once deprived of her sustaining buoyancy and *joie de vivre*.

Dr. Cameron has drawn for us all, laymen and craftsmen alike, a wonderfully sensitive portrait for which none who study it could fail to be grateful.

Surgical Pathology. By PETER A. HERBERT, M.D., Professor of Pathology, Jefferson Medical College, Philadelphia. 6 × 9 in. Pp. 710, with 410 illustrations. 1948. London: Henry Kimpton. 60s.

THIS new book on surgical pathology is made up of some twenty-one chapters dealing with the various organs and systems of the body, and the one exception is that of the central nervous system. We agree with

the author that the pathology of the brain and spinal cord require a special knowledge and very special staining techniques are necessary.

For the student, practitioner, and surgeon this volume should prove of value, for it has been written in a concise, lucid, and dogmatic fashion, which, after all, is what is required from an expert in his subject.

The chapters on the breast, stomach, urinary system, and bones are particularly good and well illustrated. It is a pleasure to see such good microphotographs, each with the actual magnification given in the legend. This is of real value to the reader, for he can then form an idea of what other magnifications would look like. The only regret one has in reading through this book is that there are not more microphotographs.

Although there are many books on surgical pathology, there can be no doubt that Professor Herbert's volume will be a popular one.

The references at the end of each chapter have been well chosen, for they include all the important American and English articles which have been published during the last decade.

Osteopathie Rare. By C. CASUCCIO, Libero docente di Clinica Ortopedica nell'Universita di Bologna ; Primo aiuto dell'Istituto Ortopedico Rizzoli. With a Preface by F. DELITALA. Pp. 548, with 390 illustrations. 1949. Bologna : Edizioni Scientifiche Istituto Rizzoli. L. 5500.

BOOKS dealing with some of the less common affections of the skeleton have appeared from time to time, but nothing as comprehensive as this, which deals with most of the rarer osteopathies. Its five hundred pages are divided into three parts : the first deals with conditions involving diminished density and with the dystrophies ; the second with those showing hyperplasia and increased density ; and the third, comprising nearly eighty pages of small type, consists of a classified list of references which are amazingly comprehensive and up to date. Readers will welcome the fact that the full title of each article is included.

Every aspect of the various conditions is dealt with. A criticism that might be made is that the book is almost too encyclopædic : the authors whose work is specifically referred to in the text, as well as included in the references, are innumerable. The number of different syndromes that receive brief mention are at times rather confusing, while any and every theory of aetiology, no matter how fantastic it be, is included.

Particularly good chapters are those dealing respectively with fibrocystic diseases, dyschondroplasia, melorheostosis, and Hodgkin's disease. The illustrations of changes in bones other than the skull in Cooley's anæmia are of interest, though the condition is almost unknown in this country. It is rather surprising that leontiasis ossea is not referred to in the discussion on polyostotic fibrous dysplasia : a few lines are devoted to it in the second part of the work.

In the chapter dealing with chondro-osteo-dystrophy, gargoylism receives only the briefest mention, while the lipoid error responsible is not referred to at all ; nor is this condition considered in the chapter dealing with lipoidosis. It is interesting to note that though the lipoid errors are discussed at some length, and with ample illustrations, the author was unable to produce a Gaucher's disease, which appears to be even less common in Italy than in this country.

The volume is admirably produced in every way : the illustrations, including a large number of microphotographs, are exceptionally good. Naturally the radiographs are abundant, though they receive no more than their share of attention in the text. The author has borrowed several illustrations from articles published by others : in some of these the features seem to be darkened and accentuated to a degree which gives rather a false impression of the true radiological appearances of the condition illustrated. Also one or two of the radiographs of conditions in which marked osteoporosis is present strike one, rightly or wrongly, as having been rather unwisely ' touched up '.

However, there is no doubt this volume is more than worthy of the great Italian school from which it emanates, the school which owes so much to the late Vittorio Putti, to whom the author refers with gratitude in the preface.

This volume should prove an invaluable book of reference.

Cardiovascular Studies. By KENNETH J. FRANKLIN, D.M., F.R.C.P., Professor of Physiology at the Medical College of St. Bartholomew's Hospital. $7\frac{1}{4} \times 9\frac{1}{2}$ in. Pp. 306 + xvi, with 102 illustrations. 1948. Oxford : Blackwell Scientific Publications. 42s. net.

THIS book describes the long and painstaking researches which Professor Franklin has undertaken into the comparative anatomy and physiology of the right auricle, with special reference to the Eustachian valve (valve of the inferior vena cava) and the intervenous tubercle of Lower. It includes an exhaustive account of the older literature referring to these structures—what may properly be described as the historical introduction to the present study—as well as of the more modern views upon their function expressed in recent publications.

To this mass of material the author has added his own careful observations made upon over 200 specimens representing every order of mammals. He has measured the length of the heart from the junction of the (right) anterior superior vena cava and right atrium to the apex of the heart, and by expressing the maximum height of the Eustachian valve as a percentage of the heart length he obtains what he calls the index of the heart. He then divides all mammalian hearts into four types according to the direction of the anterior caval flow and the point at which this stream of blood impinges upon the wall of the right atrium, proceeds to formulate a correlation between index and type, and finally concludes that the development of the Eustachian valve is governed by streamlining of blood in the auricle—that the valve is in fact the result of functioning rather than a structure to which one has to assign a function.

Professor Franklin has obtained support for this thesis whenever possible by cineradiographic methods. Advanced students of comparative anatomy, and research workers whose interests lie in this field, should study the details of all his observations, which he gives in full. It is possible that the cardiologist also may find something of practical value in the book, though the author does not make any claim for it except as a contribution to pure science.

British Surgical Practice. General Editors : Sir ERNEST ROCK CARLING, F.R.C.S., F.R.C.P., Consulting Surgeon, Westminster Hospital, and J. PATERSON ROSS, M.S., F.R.C.S., Surgeon and Director of Surgical Clinical Unit, St. Bartholomew's Hospital ; Professor of Surgery, University of London. In eight volumes. $6\frac{3}{8} \times 8\frac{3}{8}$ in. Volume IV. Pp. 486 + xxvii, with index, 261 illustrations. Volume V. Pp. 494 + xxvii, with index, 220 illustrations. 1948. London : Butterworth & Co. Ltd. Price per volume £3, Index £1.

Volume IV of this comprehensive and outstanding work contains some thirty-six interesting and practical articles dealing with surgical subjects, commencing with facial palsy and ending with hiccup.

It is difficult to single out any of the articles for criticism as they are all uniformly good ; but, perhaps,

for the lucid, practical, and pithy article, Professor Hadfield writing on fat necrosis is easily the master of his subject.

It is difficult to believe that anyone could perform the Jianu tubo-gastrostomy with ease, as in advanced cases of carcinoma of the œsophagus the stomach is so small it will only hold a few ounces. To make a long tube of stomach tissue under such conditions is almost impossible. Surely, with the operation of gastrostomy which is so rarely performed to-day, one operative procedure, instead of several, would be quite sufficient.

The article on gonorrhœa is a model of what is required by the practitioner and surgeon alike. It gives in a practical manner just those facts that are necessary for the adequate diagnosis and treatment of this disease.

The illustrations throughout the volume are good and well chosen and enhance the value of the written word.

No surgeon can afford to be without this work as it manifests the best of British surgery.

We look forward with pleasure to the remaining volumes.

Volume V of this surgical work deals with those surgical diseases and problems which are to be found between the letters H and L. Bodley Scott contributes an excellent article on Hodgkin's disease and other reticuloses, while P. M. F. Bishop writes on a subject he has made his own—namely, hormones. Professor Dew, of Sydney, deals with hydatid disease in a masterly way, and Professor Learmonth gives a very good exposition on hyperpiesia.

T. P. McMurray writes on his favourite subject, internal derangement of the knee, and the chapter is full of useful and practical advice.

The surgery of the kidney and ureter is dealt with in a very comprehensive manner, covering six chapters, the contributors being Clifford Morson, J. B. Oldham, E. W. Riches, W. E. Underwood, Yates Bell, and David Band. This kidney section is the best in the volume and is really first class.

Professor Grey Turner writes on the surgical treatment of cirrhosis of the liver, and the chapter is full of useful practical information gained from a life-long study of the subject. We are glad to see that Grey Turner still considers that porto-caval anastomosis is still in the experimental stage and that the operation should not be lightly undertaken.

Price Thomas deals with tumours of the lung in a very lucid fashion and makes the whole subject appear simple to understand.

Professor Stammers contributes a useful chapter on lymphogranuloma inguinale and illustrates his article with some telling photographs.

The whole volume is well written, compiled, and indexed; a great credit to the general editors. It is very difficult in a work which comprises many contributors to get uniformity, yet in this volume this has been attained.

The illustrations are very good throughout the volume and the references at the end of the several chapters are up to date and comprehensive.

There are only three more volumes to be published and no surgeon can possibly afford to be without this excellent and truly British surgical production.

The 1948 Year Book of General Surgery. Edited by Evarts A. Graham, A.B., M.D., Professor of Surgery, Washington University School of Medicine, etc. $4\frac{5}{8} \times 7$ in. Pp. 717, with 190 illustrations. 1949. Chicago: The Year Book Publishers Inc. (London: H. K. Lewis & Co.). 25s.

We have come to rely on this useful volume to obtain a practical survey of the advances made in general surgery during the last year. Professor Graham has the happy knack of selecting just the most important surgical papers and giving the reader a lucid and interesting précis of them. It is this excellent selection which makes the volume so valuable to the general surgeon who wishes to be kept *au fait* with surgical progress.

Professor Graham covers the whole field of surgery as a general surgeon should, including such branches as vascular surgery, thoracic surgery, and fractures, with any or all of which a good general surgeon may have to deal.

Biochemistry is coming more and more to the fore in surgery, and metabolism and electrolytes must be understood by any surgeon who practises his art to-day. In this volume the reader will find that the editor has given biochemistry ample space.

The surgery of the nervous system is well covered and papers on brain abscess and hydrocephalus are abstracted.

The value of subcutaneous heparin in the treatment of arterial thrombotic disease is discussed and a word of warning given to users of this drug.

Many useful drawings and photographs are to be found throughout this book: they have been well chosen and do enhance the value of the volume. A most useful and practical Year Book.

Diseases of the Breast. By Sir Crisp English, K.C.M.G., F.R.C.S., Consulting Surgeon, St. George's Hospital. $5\frac{3}{8} \times 8\frac{1}{2}$ in. Pp. 128 + vii. 1948. London: J. & A. Churchill Ltd. 8s. 6d.

This little book appears rather to fall between two stools—those of the summary and the thesis. It would appear to be founded on a recent series of 250 non-hospital cases—a fact which is rather hidden at the end of the first chapter on anatomy of the breast. It is obvious, however, that the author is drawing from a wide personal experience much more extensive than this and he has added to his own knowledge many references to other workers in the same field. There is little of breast pathology that is omitted and the author's style is simple and lucid, but unless the book is looked upon merely as a précis, which it obviously is not, it tends rather to gloss superficially over many of the less common but none the less interesting conditions occurring in the breast. It is rather surprising to find in a book published in 1948 no mention of the use of penicillin in the treatment of breast abscess, and the inclusion of teratoblastoma among innocent tumours (p. 31) would not find general pathological favour. It is perhaps being hypercritical to suggest that it is the underlying rather than the overlying skin which needs attention in cases of diffuse hypertrophy (p. 49)—but this is rather indicative of the impression the whole book gives of rapid compilation. A two-page chapter on modern anæsthesia might well be omitted in future editions—but the book would be greatly enhanced by the addition of illustrations and/or diagrams.

The Present Status of the Surgical Treatment of Hyperthyroidism. By Warren H. Cole, M.D., Professor and Head of the Department of Surgery, University of Illinois College of Medicine, Chicago, Ill., and Edson Fairbrother Fowler, M.D., Assistant in Surgery, University of Illinois College of Medicine, Chicago, Ill. Being No. 4, *American Lecture Series*. $5\frac{1}{2} \times 8\frac{1}{2}$ in. Pp. 81 + viii, with 16 illustrations. 1948. Springfield, Ill.: Charles C. Thomas. (Oxford: Blackwell.) 10s. 6d. net.

This small monograph sets out to evaluate the indications for the surgical treatment of hyperthyroidism. The advent of the antithyroid drugs of the thiocarbonamide type has been tested, and, although a number of cases of hyperthyroidism do respond to this form of therapy, surgery is still required in a proportion of cases.

The antithyroid drugs have definite disadvantages, they may cause toxic reactions and are slow in their action, and cause increase in the vascularity of the gland.

All these important points are discussed in detail in this monograph, and surgery is given its real place in the treatment of hyperthyroidism.

Handbook of Orthopædic Surgery. By ALFRED RIVES SHANDS, jun., B.A., M.D., Medical Director of the Alfred I. du Pont Institute of the Nemours Foundation, Wilmington, Delaware, etc. In collaboration with RICHARD BEVERLY RANEY, B.A., M.D., Associate in Orthopædic Surgery, Duke University School of Medicine, Durham, North Carolina, etc. Third edition. $5\frac{1}{2} \times 8\frac{1}{2}$ in. Pp. 574 + xviii, with 159 illustrations. 1949. London: Henry Kimpton. 32s. 6d.

THE third edition of this small handbook has been carefully revised and brought up to date. It should prove of value to both undergraduate and postgraduate students, as well as to nurses and physiotherapists.

Actual radiographs would be much more convincing than drawings made from them. This is the only real criticism we have to make with regard to this book.

Practical Aspects of Thyroid Disease. By GEORGE CRILE, jun., M.D., F.A.C.S., Department of Surgery, Cleveland Clinic. $5\frac{5}{8} \times 7\frac{1}{4}$ in. Pp. 355 + xviii, with 101 illustrations. 1949. Philadelphia and London: W. B. Saunders Co. 30s.

IT is the practical aspects of disease which are of importance to the clinician, and if that disease requires surgery for its cure then all surgically minded clinicians are truly interested. Professor George Crile, jun., has followed in his father's footsteps and has gained much from the lucid teaching and practical technique from that great American surgeon. Little wonder, then, that he can display such an intimate understanding of thyroid disease and discourse on the pros and cons of treatment.

The treatment of thyroid disease has undergone much change in the last decade, and it is evident that both physicians and surgeons must co-operate to the full in this treatment.

Professor Crile has written a book which is based on practical experience gained over many years, and it covers the whole field of diseases of the thyroid gland. His technique is sound and practical to a degree, while the illustrations in this book are excellent and do enhance the value of the volume.

A useful book, full of important information, and of real value to all surgeons who are called to operate on the thyroid gland.

Frakturen und Luxationen. Ein Lehrbuch für Studierende und Arzte. By ARTHUR HÜBNER. Large 8vo. Pp. 233 + vi, with 133 illustrations. 1948. Ladenpreis: Halbleinen. Bound, DM 18.60.

THIS monograph will no doubt be found useful by the German medical student, as it deals with the subject of fractures and dislocations at the undergraduate level. There are few references to authorities other than those representing the German-speaking countries, and the methods and techniques advocated are predominantly those of the Böhler school of fracture surgery. In an effort to condense the account of the principles of this subject, the author has dealt inadequately with such important aspects of the problem as complications and non-union.

BOOK NOTICES

[The Editorial Committee acknowledge with thanks the receipt of the following volumes. A selection will be made from these for review, precedence being given to new books and to those having the greatest interest to our readers.]

Surgical Technique and Principles of Operative Surgery. By A. V. PARTIPILO, M.D., F.A.C.S., Associate Clinical Professor of Surgery, The Stritch School of Medicine of Loyola University; etc. With a Foreword by ALTON OCHSNER, M.D., F.A.C.S. Fourth edition. $7\frac{1}{8} \times 9\frac{7}{8}$ in. Pp. 676, with 547 illustrations. 1949. London: Henry Kimpton. 75s.

An Atlas of Traumatic Surgery. Illustrated Histories of Wounds of the Extremities. By JOSEP TRUETA, M.D. (Barcelona), D.Sc. (Hon.) Oxon, F.R.C.S. (Hon.) Canada, Surgeon at the Wingfield-Morris Orthopædic Hospital, Oxford. $7\frac{1}{4} \times 9\frac{3}{4}$ in. Pp. 150 + viii, with 188 illustrations. 1949. Oxford: Blackwell Scientific Publications. 30s.

The 1948 Year Book of Urology. Edited by OSWALD S. LOWSLEY, M.D., F.A.C.S., Director, James Buchanan Brady Foundation, New York Hospital; etc. $4\frac{5}{8} \times 7$ in. Pp. 445, with 79 illustrations. 1949. Chicago: The Year Book Publishers Inc. (London: H. K. Lewis & Co.). 26s.

Tuberculosis of the Knee-joint. By JOHANNES MORTENS. $6\frac{5}{8} \times 9\frac{7}{8}$ in. Pp. 550 + xvi, with a number of illustrations. 1949. Copenhagen: Einar Munksgaard. (London: H. K. Lewis & Co.) Dan. kr. 30.

Demonstrations of Physical Signs in Clinical Surgery. By HAMILTON BAILEY, F.R.C.S. (Eng.), F.A.C.S., F.I.C.S., F.R.S.E., Surgeon and Surgeon-in-Charge of the Genito-urinary Department, Royal Northern Hospital, London; etc. Eleventh edition. Issued in Four Parts. $5\frac{5}{8} \times 8\frac{3}{4}$ in. Part IV, Pp. 305–426 + iv, with 137 illustrations, a large number in colour. 1949. Bristol: John Wright & Sons Ltd. 8s. 6d. each part. Bound volume, 34s.

Cunningham's Manual of Practical Anatomy. Revised and edited by JAMES COUPER BRASH, M.C., M.A., M.D., F.R.C.S. (Edin.), F.R.S.E., Professor of Anatomy, University of Edinburgh. Eleventh edition. $4\frac{7}{8} \times 7\frac{1}{4}$ in. Volume I: General Introduction; Upper Limb; Lower Limb. Pp. 387 + xix, with 191 illustrations, many coloured (44 as plates). 1949. London: Oxford University Press 21s.

Lawson Tait, 1845–1899. By I. HARVEY FLACK, M.D. $4\frac{1}{4} \times 7\frac{1}{4}$ in. Pp. 148 + viii, with 12 plates. 1949. London: William Heinemann Medical Books Ltd. 17s. 6d.

British Medical Association. Proceedings of the Annual Meeting, 1948. $6 \times 9\frac{3}{4}$ in. Pp. 415. 1949. London: Butterworth & Co. (Publishers) Ltd. 35s.

INDEX TO VOLUME XXXVI

PAGE

ABDOMEN, foreign body in, case report - - 98
Abdominal muscles, subcutaneous rupture of, case report - - - - - 434
Abscess, cerebral, thorotrast pyograms in - 240
— — in traumatic skull defects, tantalum plating - 33
— subphrenic - - - - - - 185
Accessory urethral canal in male - - - 181
Acetylcholine in aetiology of myasthenia gravis - 385
ADAMS, WILFRID: Excision of second primary cancer of colon (juxtacæcal) 20 years after removal of cancer of splenic flexure, case report - - - - - - 218
Adenocarcinoma of rectum, supervoltage X-ray therapy in - - - - - - 379
Age incidence of argentaffinoma of gastro-intestinal tract - - - - - 130
— — carcinoma of œsophagus - - - 70
— — — rectum - - - - - 378
— — congenital obstruction of colon - - 54
— — lymphadenoid goitre - - - 44
— — peptic ulcer in Nigeria - - - 61
Amigen in myasthenia gravis - - - 385
Amputation, traumatic, of penis - - - 368
Anal canal, carcinoma of, supervoltage X-ray therapy in - - - - - - 376
— fistula, malignant degeneration of, case report 100
— intermuscular septum - - - - 279
Aneurysm, cirsoid, boiling-water injections for - 346
— traumatic false, simulating bone sarcoma - 310
ANNIS, DAVID: *See* WELLS, CHARLES, jt. auth. -
Aplasia, bilateral, of vas deferens - - - 417
Appendicitis, Spigelian hernia simulating, case report - - - - - - 433
Appendix, bilharzia of, with strangulation of ileum, case report - - - - - - 428
Argentaffinoma of gastro-intestinal tract - - 130
Arm, venous obstruction in - - - 155
Arterial disturbances in the lower limbs, investigation and treatment of - - - 286
Arteriography, peripheral, technique - - 287
Arteriosclerosis in lower limbs - - 288, 289
Artery, splenic, spontaneous rupture of - - 203
Arthritis, interarticular, of spine, radiography in - 236
Atelectasis, post-operative pulmonary - - 256
Athletes' hernia of tibialis anticus muscle - - 405
ATKINS, HEDLEY: Radical mastectomy - - 87
Atypical Crohn's disease - - - - 66
AYLETT, STANLEY O.: Post-operative biliary fistula 387

BAKER, S. L.: Hyperplastic callus formation, with or without evidence of a fracture, in osteogenesis imperfecta, histology - - 1
BANHAM, A. R.: Total denudation of the penis - 268
BARON, ANTHONY: Defect in the broad ligament and its association with intestinal strangulation - - - - - - - 91
BARRIE, H. J.: Foam-cell granuloma in chronic pyonephrosis simulating tuberculosis .. 316
Bassini type of herniorrhaphy, simple experimental method of evaluation - - - 339
BEATTIE, W. M., and MUIR, J. D.: A case of carcinoma of the duodenum - - - 436
B.E.C.C. statistics in cancer of rectum - - 377
BEGG, A. CHARLES, and FALCONER, MURRAY A.: Plain radiography in intraspinal protrusion of lumbar intervertebral disks, a correlation with operative findings - - - 225

PAGE

Bence-Jones proteinuria with solitary plasmocytoma of bone - - - - - 17, 20
BENNETT-JONES, M. J., and WIGGLESWORTH, G. F.: Atypical Crohn's disease - - - 66
BICKFORD, B. J.: Mediastinal cysts of gastric origin 410
Bilharzia of appendix, with strangulation of ileum, case report - - - - - - 428
Bilharzial ureter - - - - - - 148
Biliary fistula, post-operative - - - 387
BINGOLD, A. C.: A case of polyostotic fibrous dysplasia - - - - - - 22
BIRT, ST.J. M. C.: *See* MIMPRISS, T. W., jt. auth.
Bladder, fistula into rectum - - - 175
— and rectum, defunctioning of, in pelvic cancer - 421
Boiling-water injections for cavernous hæmangiomas and cirsoid aneurysms - - - 346
Bone lesions in Hodgkin's disease - - - 414
— sarcoma, traumatic false aneurysm simulating - 310
— solitary plasmocytoma of, with renal changes - 16
BORRIE, JOHN: A complication of cholecystgastrostomy, case report - - - - 326
BOWIE, DONALD C., and KAY, A. W.: Traumatic false aneurysm simulating bone sarcoma - 310
BRAIN, ROBERT H.: Co-incidental strictures of œsophagus and stomach, case report - - 440
Breast, carcinoma of, immediate skin-graft following radical mastectomy - - - - 401
BREWER, A. C., and MARCUS, R.: Massive spontaneous intraperitoneal hæmorrhage - - 198
Broad ligament, defect in, its association with intestinal strangulation - - - - 91
BROCKIS, J. G.: *See* MOIR, P. J., jt. auth.
Bronchoscopy in post-operative pulmonary atelectasis - - - - - - 261
Bulbous urethra, rupture of - - - 369
Burgess, Arthur Henry: In memoriam - - 104
BURKITT, ROBIN: Fatal hæmorrhage into a perirenal liposarcoma - - - - - - 439

CÆCAL fæcolith - - - - - 55
Cæcum, chronic non-specific ulceration of, case report - - - - - - 331
Callus formation, hyperplastic, in osteogenesis imperfecta - - - - - - 1
— — — — — histology - - - 11
CANNEY, R. L.: Neurogenic tumours of the stomach 139
Carcinoid tumour of small intestine with secondary deposits in various organs, case report - 215
Carcinoma of anal canal, supervoltage X-ray therapy in - - - - - - - 376
— breast, immediate skin-graft following radical mastectomy - - - - - 401
— coli, duodenocolic fistula complicating - - 204
— — second primary, 20 years after cancer of splenic flexure, case report - - 218
— of duodenum, case report - - - 436
— œsophagus, clinico-pathological study - - 70
— partial hepatectomy in advanced cases - - 397
— pelvic, defunctioning of bladder and rectum in - 421
— of rectum, deep X-ray therapy in - - 377
— — radium therapy in - - - - 377
— — supervoltage X-ray therapy in - - 376
— renal, secondaries in ureteric lumen - - 164
— of stomach perforating into peritoneal cavity, case report - - - - - - 435
CARVER, J. H.: Megalo-ureter, a report of two cases 168
Catheter, indwelling, in repair of urethra - - 371

PAGE

Cavernous hæmangiomas, boiling-water injections for - - - - - - 346
Cerebellar abscess, thorotrast pyograms in 240, 251
— — in traumatic skull defects, tantalum plating - 33
Cholecystgastrostomy, complication of, case report 326
Cholinesterase in aetiology of myasthenia gravis - 385
Cirsoid aneurysms, boiling-water injections for - 346
CLELAND, GAVIN: A case of traumatic pararenal pseudohydronephrosis - - - 172
COLE, PERCIVAL P.: Recurrent epithelioma of lip - 79
— — and HUNT, ALAN H.: The treatment of cavernous hæmangiomas and cirsoid aneurysms by the injection of boiling water - - 346
Cole's syringe - - - - - 349
Colitis, trichobezoar simulating - - - 409
— ulcerative, histopathology of semisquamous epithelial layer - - - - 84
Colon, carcinoma of, duodenocolic fistula complicating - - - - - 204
— — second primary, 20 years after cancer of splenic flexure, case report - - 218
— congenital obstruction of, in adult - - 52
— sigmoid, hæmangioma of, case report - - 210
— transverse, localized diverticulitis in - - 319
Colostomy in carcinoma of rectum - - - 377
Congenital absence of vagina associated with bilateral herniæ of uterus, tubes, and ovaries, case report - - - - - 99
— fistulæ between rectum and urinary tract - 175
— obstruction of colon in adult - - - 52
Crohn's disease, atypical - - - - 66
CUNINGHAM, KATHLEEN, and SMITH, K. VINER: A case of intussusception caused by endometriosis of ileum - - - - 50
Cyst(s), gas, of intestine - - - - 49
— mediastinal, of gastric origin - - - 410
— ulcerating sebaceous, of forehead, case report - 103

DAVSON, J.: *See* GOLDBERG, H. M., jt. auth.
DAX, E. CUNNINGHAM, and RADLEY-SMITH, E. J.: The operation of prefrontal leucotomy 74
Denudation, total, of penis - - - - 268
Diaphragmatic hernia, volvulus of stomach in - 58
Diet after gastro-enterostomy for ulcer in Nigeria - 64
Di-isopropyl-fluore-phosphonate in myasthenia gravis - - - - - - 385
Disks, lumbar intervertebral, intraspinal protrusion of, radiography in - - - - 225
Diverticulitis, localized, in transverse colon - - 319
Diverticulum, Meckel's, histopathology of semisquamous epithelial layer - - - 87
— perforated jejunal, case report - - - 214
DORAN, F. S. A.: Malignant degeneration of an anal fistula, case report - - - - 100
— — and LONSDALE, W. H.: A simple experimental method of evaluation for the Bassini and allied types of herniorrhaphy - - 339
Drainage, suprapubic, in rupture of urethra 364 et seq.
DRAKE, E. P. HALL, and GOODWIN, J. F.: Duodenocolic fistula complicating carcinoma coli - 204
Duodenal ulcer in Nigeria - - - - 60
Duodenocolic fistula complicating carcinoma coli - 204
Duodenum, carcinoma of, case report - - 436
DURAN-JORDA, FREDERIC: Histopathology of the semisquamous epithelial layer in the small intestine - - - - - - 84
Dysplasia, polyostotic fibrous - - - 22

ECTOPIC ureter, urinary incontinence due to - 391
Egyptian skulls, ancient, hyperostosis in - 423
Eleusine coracana in diet, spontaneous paralytic ileus and - - - - - - 358
ELLIS, MAURICE: A study of peptic ulcer in Nigeria 60

PAGE

Embolus, tumour, sudden death at operation due to, case report - - - - - 429
Endometriosis of ileum, intussusception caused by - 50
Epilepsy, tantalum plating of skull defects and - 38
Epiphysis, 'persistent' - - - - - 235
Epithelial layer, semisquamous, in small intestine, histopathology of - - - - 84
Epithelioma, recurrent, of lip - - - 79
Extracranial neurectomy for glossopharyngeal neuralgia - - - - - - 208
Extravasation of urine in urethral injuries - - 367

FÆCOLITH, cæcal - - - - - 55
FAIRBANK, Sir H. A. THOMAS: Hyperplastic callus formation, with or without evidence of a fracture, in osteogenesis imperfecta - 1
FALCONER, MURRAY A.: *See* BEGG, A. CHARLES, jt. auth.
Fallopian tubes, ovaries, and uterus, herniæ of, with congenital absence of vagina, case report - 99
Fascia lata patch grafts in repair of herniæ of tibialis anticus muscle - - - - 406
Femoral vein, rupture and suture of - - 97
Fibrosis due to X-ray therapy in cancer of rectum - 379
Fibrous dysplasia, polyostotic - - - 22
Fistula, anal, malignant degeneration in, case report - - - - - 100
— between rectum and urinary tract - - 175
— biliary, post-operative - - - - 387
— duodenocolic, complicating carcinoma coli - 204
Foam-cell granuloma in chronic pyonephrosis simulating tuberculosis - - - - 316
Forearm, tumour of, gross hypertrophy of palmaris longus muscle simulating, case report - 213
Forehead, ulcerating sebaceous cyst of, case report - 103
Foreign body in abdomen, case report - - 98
— — pelvis, localization of - - - 367
Fracture, compression, of first lumbar vertebra observed radiographically - - - 236
Frontal abscess, thorotrast pyograms in - - 253
— sinus wounds, tantalum plating of skull defects and - - - - - - - 37
Fruit skins in gall-bladder - - - - 326
F.S.U.'s, treatment of urethral injuries at - - 366

GALLAGHER, H. W.: Spontaneous herniation through the transverse mesocolon - - 300
Gall-bladder, fruit skins in - - - 326
Gas cysts of intestine - - - - 49
Gastrectomy, partial, persistent jejunitis following, case reports - - - - - 325
Gastric cyst in mediastinum - - - 410
— neurinoma with hæmatemesis, case report - 430
— ulcer in Nigeria - - - - - 60
Gastro-enterostomy for ulcer in Nigeria, diet after - 64
Gastro-intestinal tract, argentaffinoma of - - 130
GILLAM, J. F. E.: Spontaneous rupture of the splenic artery - - - - 203
Glossopharyngeal neuralgia: extracranial neurectomy - - - - - 208
Goitre, lymphadenoid - - - - - 41
GOLDBERG, H. M., and DAVSON, J.: Lymphadenoid goitre - - - - - 41
GOODWIN, JOHN: A study of post-operative pulmonary atelectasis - - - - 256
— — *See* DRAKE, E. P. HALL, jt. auth.
Gordon-Taylor, Sir Gordon - - - 337
GOULDING, ROY: Gross hypertrophy of the palmaris longus muscle simulating a tumour of the forearm, case report - - - 213
GRAHAM, M. P.: *See* LEWIN, WALPOLE, jt. auth.
Granuloma, foam-cell, in chronic pyonephrosis simulating tuberculosis - - - 316

GREER, K. C.: Diffuse sarcoma of the peritoneum, case report - - - - - - 432
GRIERSON, JOHN, and LEACOCK, AUBREY: Spontaneous ventral hernia, case report - - 327
Groin, ulceration in, in Hodgkin's disease - - 414

HÆMANGIOMA, cavernous, boiling-water injections for - - - - - - 346
— of sigmoid colon, case report - - - 210
Hæmatemesis with gastric neurinoma, case report - 430
Hæmaturia from minute papilloma of renal pelvis, case report - - - - - - 438
Hæmoglobin estimation in radical mastectomy - 115
Hæmorrhage, massive spontaneous intraperitoneal - 198
— into a perirenal liposarcoma, report of fatal case 439
— secondary, in boiling-water injection in angioma 352
HALL, G. F. M.: A case of thymolipoma - - 321
Hashimoto's disease (lymphadenoid goitre) - 41
Head, tumours of, in Hodgkin's disease - - 414
Heminephrectomy in ureteric ectopia - - 393
Hepatectomy, partial - - - - 397
Hepatoma, benign, case report - - - 425
HERDMAN, J. R.: Perforation of carcinoma of the stomach into the general peritoneal cavity, case report - - - - - - 435
Herniæ, bilateral, of uterus, tubes, and ovaries, in association with congenital absence of vagina, case report - - - - - - 99
— diaphragmatic, volvulus of stomach in - - 58
— inguinal, functional anatomy of, its bearing on operative treatment - - - 264
— para-inguinal - - - - - - 327
— Spigelian, simulating acute appendicitis, case report - - - - - - 433
— spontaneous ventral, case report - - 327
— of tibialis anticus muscle in athletes - - 405
Herniation, spontaneous, through transverse mesocolon - - - - - - 300
Herniorrhaphy, Bassini type of, simple experimental method of evaluation - - - - 339
Hodgkin's disease, bone lesions in - - - 414
HOLMAN, C. C.: Hæmangioma of the sigmoid colon, case report - - - - - - 210
HUGHES, E. S. R.: Venous obstruction in the upper extremity - - - - - - 155
HUGHES, MARK: A case of bilharzia of the appendix, with strangulation of ileum, case report - 428
HUNT, ALAN H.: *See* COLE, PERCIVAL P., jt. auth.
HUNT, R. S.: Subphrenic abscess - - - 185
HUNTER, W. R.: A case of benign hepatoma, case report - - - - - - 425
Hunterian Lecture:—
Poole-Wilson, D. S.: Missile injuries of the urethra - - - - - - 364
Hürthle cells in lymphadenoid goitre - 43, 46
Hypernephroma, operation for, death due to tumour embolus, case report - - 429
— resection for pulmonary metastases - - 200
— ureteric secondaries from - - - 164
Hyperostosis in ancient Egyptian skulls - - 423
Hypertrophy, gross, of palmaris longus muscle simulating tumour of forearm, case report - 213

ILEUM, endometriosis of, intussusception caused by - - - - - - - 50
— strangulation of, with bilharzia of appendix, case report - - - - - - 428
Ileus, spontaneous paralytic - - - 352
Infection in plating of skull defects with tantalum - 33
Inguinal hernia, bearing of functional anatomy on operative treatment - - - 264
Injection treatment of varicose veins - - 294
Injuries (*see* Trauma)
In Memoriam:—
Arthur Henry Burgess - - - - 104
Interstitial-cell tumours of testicle - - - 81
Intervertebral disks, lumbar, radiography in intraspinal protrusion of - - - - - 225
Intestinal strangulation in association with defect in broad ligament - - - - - 91
— — histopathology of semisquamous epithelial layer - - - - - - 84
Intestine, gas cysts of - - - - 49
— small, carcinoid tumour of, with secondary deposits in various organs, case report - - 215
— — semisquamous epithelial layer in, histopathology of - - - - 84
Intracerebral complications after tantalum plating of skull defects - - - - 37
Intraperitoneal hæmorrhage, massive spontaneous - 198
Intraspinal protrusion of lumbar intervertebral disks, radiography in - - - 225
Intussusception caused by endometriosis of ileum - 50
Iodine metabolism in thyroid adenoma - - 313

JAMIESON, R. A.: Subcutaneous rupture of muscles of abdomen, case report - - 434
Jejunal diverticulum, perforated, case report - 214
Jejunitis, persistent, following partial gastrectomy, case reports - - - - - 325
JONES, CLIFFORD, and STEINER, R. E.: Investigation and treatment of arterial disturbances in the lower limbs - - - - - - 286
JONES, J. D. T.: Gas cysts of the intestine - - 49

KAY, A. W.: *See* BOWIE, DONALD C., jt. auth.
KEELE, K. D.: *See* MATHESON, N. M., jt. auth.
KIDD, H. A.: Two cases of volvulus of the stomach in a diaphragmatic hernia - - - 58
Kidney (*see also* Renal)
— supernumerary - - - - 391, 392
KINMONTH, J. B., and ROBERTSON, D. J.: Injection treatment of varicose veins - - - 294

LANGLEY, G. F.: Urinary incontinence due to ectopic ureter - - - - - 391
LEACOCK, AUBREY: *See* GRIERSON, JOHN, jt. auth.
LEASK, A. R.: *See* NUSSEY, A. M., jt. auth.
Legs, arterial disturbances in investigation and treatment of - - - - - 286
LESLIE, MARGARET, and STENHOUSE, DAVID: A case of localized osteitis fibrosa of the skull - 211
Leucotome, MacGregor - - - - 74
Leucotomy, prefrontal, operation of - - 74
LEWIN, WALPOLE, GRAHAM, M. P., and NORTHCROFT, G. B.: Tantalum in the repair of traumatic skull defects - - - - - 26
Leydig cells in tumour of testicle - - - 81
Ligament, broad, defect in, its association with intestinal strangulation - - - - 91
Lip, recurrent epithelioma of - - - 79
Lipomata, intrathoracic, relationship to thymolipoma 321
Liposarcoma, perirenal, fatal hæmorrhage into, case report - - - - - - 439
Lister's sounds in repair of urethra - - - 370
LLOYD, ERIC I.: Ruptured quadriceps - - 94
LOCKHART-MUMMERY, H. E.: Localized diverticulitis in the transverse colon - - 319
LONSDALE, W. H.: *See* DORAN, F. S. A., jt. auth.
LOVETT-CAMPBELL, A. C.: Large ulcerating sebaceous cyst of forehead, case report - - 103
LUMB, GEORGE: Solitary plasmocytoma of bone with renal changes - - - - 16
Lumbar intervertebral disks, intraspinal protrusion of, radiography in - - - - 225

PAGE

Lumbar vertebra, fifth, anomalies of - - 236
— — first, compression fracture of, seen radiologically - - - - - 236
Lumbosacral arthritis observed radiographically - 236
Lymphadenoid goitre - - - - 41
Lymphomata, multiple, formation of - - 85
Lytle's procedure in inguinal hernia - - 264

MACALPINE, JAS. B.: Implantation of secondaries from a renal carcinoma ('hypernephroma') within the ureteric lumen - 164
MacGregor leucotome - - - - 74
MACKENZIE, KENNETH G. F.: Simultaneous injury of rectum and ureter, case report - - 219
MAKAR, NAGUIB: The bilharzial ureter - - 148
Male, accessory urethral canal in - - - 181
Malignancy, metastatic, pulmonary resection for 200
Malignant degeneration of anal fistula, case report - 100
MARCUS, R.: *See* BREWER, A. C., jt. auth.
— — *See* REID, HUGH, jt. auth.
Mastectomy, radical - - - 87, 113
— — immediate skin-graft in - - - 401
MATHESON, N. M., and KEELE, K. D.: A radiological appearance of the papilla vateri in pancreatic disease, case report - - 329
Meckel's diverticulum, histopathology of semi-squamous epithelial layer - - - 87
Mediastinal cysts of gastric origin - - - 410
Megalo-ureter - - - - - 168
Meningiomas in Pharaoh's people - - - 423
Meningitis in traumatic skull defects, plating and - 33
Mesocolon, transverse, spontaneous herniation through - - - - - 300
Mesothelioma of peritoneum - - - 359
Metastasis from carcinoma of œsophagus 71, 72
Metastatic malignancy, pulmonary resection for - 200
Microcolon - - - - - 53
Millet ragi in aetiology of paralytic ileus - - 358
MIMPRISS, T. W., and BIRT, ST.J. M. C.: Sudden death at operation due to tumour embolus, case report - - - - - 429
Missile injuries of urethra - - - - 364
MOIR, P. J., and BROCKIS, J. G.: Observations on bone lesions in Hodgkin's disease - - 414
MORRISON, JOHN, T.: Glossopharyngeal neuralgia, extracranial neurectomy - - - 208
MUIR, J. D.: *See* BEATTIE, W. M., jt. auth.
MURLEY, R. S.: A case of neurinoma of the vagus nerve in the neck, case report - - 101
Myasthenia gravis, surgico-pathological aspects of - 381
Mysore, spontaneous paralytic ileus in - - 352

NECK, neurinoma of vagus nerve in, case report - - - - - 101
Nephrectomy in bilharzial ureteritis - - 155
Nerve-blocking in venous obstructions in arm - 162
Neural arch, pars interarticularis of, defect in - 236
Neuralgia, glossopharyngeal, extracranial neurectomy - - - - - 208
Neurectomy, extracranial, for glossopharyngeal neuralgia - - - - - 208
Neurilemoma of stomach - - - 139 et seq.
Neurinoma, gastric, with hæmatemesis, case report 430
— of vagus nerve in neck, case report - - 101
Neurofibroma of stomach - - - 139, 142
Neurogenic tumours of stomach - - - 139
NICHOLSON, N. J.: Foreign body in the abdomen, case report - - - - - 98
Nigeria, study of peptic ulcer in - - - 60
Nodes, Schmorl's, radiography of - - - 235
NORTHCROFT, G. B.: *See* LEWIN, WALPOLE, jt. auth.
NUSSEY, A. M., and LEASK, A. R.: Trichobezoar - 408

PAGE

OBSTRUCTION, congenital, of colon in adult - 52
Occipital abscess, thorotrast pyograms in - 251
Œsophagectomy with presternal œsophago-gastrostomy, further report on - - - 419
Œsophago-gastrostomy, presternal, with œsophagectomy, further report on - - - 419
Œsophagus, carcinoma of, clinico-pathological study 70
— stricture of, coincidental with stricture of stomach, case report - - - - - 440
OLDFIELD, MICHAEL C.: Athlete's hernia of the tibialis anticus muscles - - - 405
Osteitis fibrosa cystica - - - - 306
— — localized, of skull, case report - - 211
Osteogenesis imperfecta, hyperplastic callus formation in - - - - - 1
— — — — — histology - - - 11
Ovaries, tubes, and uterus, herniæ of, with congenital absence of vagina, case report - - 99

PAGET-SCHROFFER syndrome - - - 155
Pain in peptic ulcer cases in Nigeria - - 62
Palmaris longus muscle, gross hypertrophy of, simulating tumour of forearm, case report - 213
Pancreatic disease, radiological appearance of papilla vateri in, case report - - - 329
Papilla vateri, radiological appearance of, in pancreatic disease, case report - - - 329
Papilloma of renal pelvis, hæmaturia from, case report 438
— ureter, bilharzial - - - - 148
Para-inguinal hernia - - - - 327
Paralytic ileus, spontaneous - - - 352
Pararenal pseudohydronephrosis, traumatic - 172
Parietal cerebral abscess, thorotrast pyograms in - 251
Pars interarticularis of neural arch, defect in - 236
PATEY, DAVID H.: Some observations on the functional anatomy of inguinal hernia and its bearing on the operative treatment - - 264
Pelvic cancer, defunctioning of bladder and rectum in - - - - - - 421
Pelvis, localization of foreign bodies in - - 367
Penicillin in rupture of urethra - - - 374
Penile urethra, rupture of - - - - 368
Penis, total denudation of - - - - 268
— traumatic amputation of - - - 368
Peptic ulcer (*see also* Duodenal; Gastric)
— — in Nigeria, study of - - - 60
Perforated jejunal diverticulum, case report - 214
Perineum, explosive wounds of, urethral injuries with 365
Perirenal liposarcoma, fatal hæmorrhage into, case report - - - - - 439
Peristalsis, visible, in peptic ulcer cases in Nigeria - 62
Peritoneal cavity, carcinoma of stomach perforating into, case report - - - - 435
Peritoneum, diffuse sarcoma of, case report - - 432
— mesothelioma of - - - - 359
'Persistent epiphysis' - - - - 235
— thymus - - - - - - 381
Pharaoh's people, meningiomas in - - - 423
Phrenic nerve, prevenous, significance of - - 161
Plasmocytoma, solitary, of bone, with renal changes 16
Polyostotic fibrous dysplasia - - - 22
POOLE-WILSON, D. S.: Missile injuries of the urethra - - - - - 364
Pott's puffy tumour - - - - 315
POWELL, KEITH: A method of defunctioning the bladder and rectum in advanced pelvic carcinoma - - - - - 421
Prefrontal leucotomy, operation of - - - 74
Presternal œsophago-gastrostomy with œsophagectomy, further report on - - - 419
PRICE, I. I.: Interstitial-cell tumours of the testicle 81
Prostato-membranous urethra, rupture of - - 370
Proteinuria, Bence-Jones, with solitary plasmocytoma of bone - - - - 17, 20

PAGE
Pseudohydronephrosis, traumatic pararenal - 172
Pulmonary atelectasis, post-operative - - 256
— resection for metastatic malignancy - - 200
Pyelography in diagnosis of supernumerary kidney 393
Pyograms, thorotrast, in cerebral abscess - - 240
Pyonephrosis, chronic, foam-cell granuloma in, simulating tuberculosis - - - 316
Pyrex syringe for injections in angioma - - 350

QUADRICEPS, ruptured - - - 94

RADIOGRAPHY in diagnosis of post-operative pulmonary atelectasis - - - 257
— intraspinal protrusion of lumbar intervertebral disks - - - - - 225
— spontaneous paralytic ileus - - - 353
Radiological appearance of papilla vateri in pancreatic disease, case report - - - 329
Radium therapy in carcinoma of rectum - - 377
RADLEY-SMITH, E. J.: *See* DAX, E. CUNNINGHAM, jt. auth.
Rare Cases:—
Carcinoid tumour of the small intestine with secondary deposits in various organs - 215
A case of bilharzia of the appendix, with strangulation of ileum - - - - - 428
A case of benign hepatoma - - - 425
A case of carcinoma of the duodenum - 436
A case of gastric neurinoma with hæmatemesis - 430
A case of localized osteitis fibrosa of the skull - 211
A case of neurinoma of the vagus nerve in the neck - - - - - - 101
Chronic non-specific ulceration of cæcum - 331
Coincidental strictures of œsophagus and stomach 440
Complete congenital absence of the vagina associated with bilateral herniæ of uterus, tubes, and ovaries - - - - - 99
A complication of cholecystgastrostomy - 326
Diffuse sarcoma of the peritoneum - - 432
Excision of second primary cancer of colon (juxtacæcal) 20 years after removal of cancer of splenic flexure - - - - - 218
Fatal hæmorrhage into a perirenal liposarcoma - 439
Foreign body in the abdomen - - 98
Gross hypertrophy of the palmaris longus muscle simulating a tumour of the forearm - 213
Hæmangioma of the sigmoid colon - - 210
Large ulcerating sebaceous cyst of forehead - 103
Malignant degeneration of an anal fistula - 100
Perforated jejunal diverticulum - - 214
Perforation of carcinoma of the stomach into the general peritoneal cavity - - 435
Persistent hæmaturia from a minute papilloma of the renal pelvis - - - - - 438
A radiological appearance of the papilla vateri in pancreatic disease - - - 329
Simultaneous injury of rectum and ureter - 219
Spigelian hernia simulating acute appendicitis - 433
Spontaneous ventral hernia - - - 327
Subcutaneous rupture of the muscles of the abdomen - - - - - - 434
Sudden death at operation due to tumour embolus - - - - - - 429
Two cases of persistent jejunitis following partial gastrectomy - - - - - 325
RAVEN, RONALD W.: Carcinoma of the œsophagus, a clinico-pathological study - - - 70
— — Partial hepatectomy - - - 397
Rectum and bladder, defunctioning of, in pelvic cancer - - - - - - 421
— carcinoma of, deep X-ray therapy in - - 377
— — radium therapy in - - - - 377

PAGE
Rectum, carcinoma of, supervoltage X-ray therapy in 376
— and ureter, simultaneous injury of, case report - 219
— urinary tract, fistula between - - - 175
REID, DOUGLAS R. K.: Argentaffinoma of the gastro-intestinal tract - - - - - 130
— — Congenital obstruction of the colon in an adult - - - - - - 52
— — Spigelian hernia simulating acute appendicitis, case report - - - - - 433
REID, HUGH: The surgico-pathological aspects of myasthenia gravis - - - - 381
— — and MARCUS, R.: Thymoma - - 271
Renal (*see also* Kidney) - - - - 164
— changes in solitary plasmocytoma of bone - 16
— pelvis, minute papilloma of, hæmaturia from, case report - - - - - - 438
Resection, pulmonary, for metastatic malignancy - 200
Reviews of Books (Titles):—
Acute intestinal obstruction (Rodney Smith) - 222
Anæsthesia for the poor risk (William W. Mushin) 442
Atlas of human anatomy, descriptive and regional (M. W. Woerdeman) - - - - 442
British surgical practice (ed. Sir Ernest Rock Carling and J. Paterson Ross) - 223, 446
Cancer (Lauren V. Ackerman and Juan A. del Regato) - - - - - - 220
Cancer of the breast (Duncan C. L. Fitzwilliams) 109
Cardiovascular studies (Kenneth J. Franklin) - 446
La chirurgie biliaire (Pierre Mallet-Guy, Rene Jeanjean, and Pierre Marion) - - 110
Cineplasty (Henry H. Kessler) - - 333
The clinical picture of thyrotoxicosis (Peter McEwan) - - - - - - 222
Confrontations radio-anatomo-cliniques (ed. De M. Chinay, R. A. Gutmann, and J. Sénèque) 111
Congenital malformations (Douglas P. Murphy) 221
Demonstrations of physical signs in clinical surgery (Hamilton Bailey) - - 221, 334
Diagnosis in daily practice (Benjamin V. White and Charles F. Geschickter) - - 220
The digestive tract in roentgenology (Jacob Buckstein) - - - - - - 333
Diseases of the breast (Sir Crisp English) - 447
Dupuytren's contraction (Tond Skoog) - - 222
Les embolies de l'artère pulmonaire et des artères des membres (René Leriche) - - - 107
The foot and ankle (Philip Lewin) - - 106
Frakturen und luxationen (Arthur Hübner) - 448
Fuss und bein (Georg Hohmann) - - 334
Hæmostatic agents (Walter H. Seegers and Elwood A. Sharp) - - - - 443
Handbook on fractures (Duncan Eve, jun., and Trimble Sharber) - - - - 221
Handbook of orthopædic surgery (Alfred Rives Shands, jun.) - - - - - 448
Handbook of surgery (Eric C. Mekie and Ian Mackenzie) - - - - 443
Hernia (Leigh F. Watson) - - - 221
Identification of tumours (N. Chandler Foot) - 442
An index of treatment (ed. Sir Robert Hutchison and Reginald Hilton) - - - 221
L'Infiltration stellaire (G. Arnulf) - - 111
Joseph Lister: the friend of man (Hector Charles Cameron) - - - - - - 445
Living anatomy (R. D. Lockhart) - - 223
La lussazione congenita dell 'anca (Marino Ortolani) - - - - - - 106
Medical research in war - - - 336
Modern surgery for nurses (ed. F. Wilson Harlow) 335
Modern trends in diagnostic radiology (ed. J. W. McLaren) - - - - - 221
Neurological complications after spinal anæsthesia (Gunnar Thorsén) - - - - 111
The 1948 year book of general surgery (ed. Evarts A. Graham) - - - - 447

PAGE

Reviews of Books (Titles), *continued.*
Nouveau précis de pathologie chirurgicale (ed. J. Patel) - - - - 107, 444
Osteopathie rare (C. Casuccio) - - - 446
Physics and the surgeon (H. S. Souttar) - - 442
Pictorial handbook of fracture treatment (Edward L. Compere and Sam W. Banks) - - 111
Practical aspects of thyroid disease (George Crile, jun.) - - - - - - 448
The present status of the surgical treatment of hyperthyroidism (Warren H. Cole and Edson Fairbrother Fowler) - - - 447
The radiology of bones and joints (James F. Brailsford) - - - - - 334
Recent advances in anæsthesia and analgesia (C. Langton Hewer) - - - 223
Recent advances in surgery (Harold C. Edwards) 105
The science and practice of surgery (W. H. C. Romanis and Philip H. Mitchiner) - - 223
The selected writings of William Clowes (ed. F. N. L. Poynter) - - - - 444
Sir Frederick Banting (Lloyd Stevenson) - 109
A surgeon's guide to local anæsthesia (C. E. Corlette) - - - - - 335
The surgery of abdominal hernia (George B. Mair) 223
The surgery of the colon and rectum (Sir Hugh Devine and John Devine) - - - 106
Surgical pathology (Peter A. Herbert) - - 445
Terapia endoarteriosa (E. Malan and G. Enria) 111
Textbook of anæsthetics (R. J. Minnitt and John Gillies) - - - - - - 222
Textbook of genito-urinary surgery (ed. H. P. Winsbury-White) - - - - 332
Treatise on surgical infections (Frank Lamont Meleney) - - - - - - 333
The treatment of acute compound injuries of the spinal cord due to missiles (Donald D. Matson) 442
The treatment of malignant disease by radium and X-rays (Ralston Paterson) - - 105
Ulcers of the stomach and duodenum (Edmundo Vasconcelos) - - - - 109
Wayfarers in medicine (William Doolin) - 107

Reviews of Books (Authors):—
Ackerman, Lauren V., and del Regato, Juan A.: *Cancer* - - - - - 220
Arnulf, G.: *L'infiltration stellaire* - - 111
Bailey, Hamilton: *Demonstrations of physical signs in clinical surgery* - - 221, 334
Banks, Sam W.: *See* Compere, Edward L., jt. auth.
Brailsford, James F.: *The radiology of bones and joints* - - - - - - 334
Buckstein, Jacob: *The digestive tract in roentgenology* - - - - - 333
Cameron, Hector Charles: *Joseph Lister: the friend of man* - - - - 445
Carling, Sir Ernest Rock, and Ross, J. Paterson: *British surgical practice* (ed.) - 223, 446
Casuccio, C.: *Osteopathie rare* - - 446
Chinay, De M., Gutmann, R. A., and Sénèque, J.: *Confrontations radio-anatomo-cliniques* (ed.) - - - - 111
Cole, Warren H., and Fowler, Edson Fairbrother: *The present status of the surgical treatment of hyperthyroidism* - - 447
Compere, Edward L., and Banks, Sam W.: *Pictorial handbook of fracture treatment* - 111
Corlette, C. E.: *A surgeon's guide to local anæsthesia* - - - - - 335
Crile, George, jun.: *Practical aspects of thyroid disease* - - - - - - 448
del Regato, Juan A.: *See* Ackerman, Lauren V., jt. auth.
Devine, Sir Hugh, and Devine, John: *The surgery of the colon and rectum* - - 106

PAGE

Reviews of Books (Authors), *continued.*
Devine, John: *See* Devine, Sir Hugh, jt. auth.
Doolin, William: *Wayfarers in medicine* - 107
Edwards, Harold C.: *Recent advances in surgery* 105
English, Sir Crisp: *Diseases of the breast* - 447
Enria, G.: *See* Malan, E., jt. auth.
Eve, Duncan (jun.), and Sharber, Trimble: *Handbook on fractures* - - - 221
Fitzwilliams, Duncan C. L.: *Cancer of the breast* - - - - - - 109
Foot, N. Chandler: *Identification of tumours* - 442
Fowler, Edson Fairbrother: *See* Cole, Warren, H., jt. auth.
Franklin, Kenneth J.: *Cardiovascular studies* - 446
Geschickter, Charles F.: *See* White, Benjamin V., jt. auth.
Gillies, John: *See* Minnitt, R. J., jt. auth.
Graham, Evarts A.: *The 1948 year book of general surgery* (ed.) - - - 447
Gutmann, R. A.: *See* Chinay, De M., jt. auth.
Harlow, F. Wilson: *Modern surgery for nurses* (ed.) - - - - - - 335
Herbert, Peter A.: *Surgical pathology* - - 445
Hewer, C. Langton: *Recent advances in anæsthesia and analgesia* - - - - 223
Hilton, Reginald: *See* Hutchison, Sir Robert, jt. ed.
Hohmann, Georg: *Fuss und bein* - - 334
Hübner, Arthur: *Frakturen und luxationen* - 448
Hutchison, Sir Robert, and Hilton, Reginald: *An index of treatment* (ed.) - - - 221
Jeanjean, Rene: *See* Mallet-Guy, Pierre, jt. auth.
Kessler, Henry H.: *Cineplasty* - - 333
Leriche, René: *Les embolies de l'artère pulmonaire et des artères des membres* - - 107
Lewin, Philip: *The foot and ankle* - - 106
Lockhart, R. D.: *Living anatomy* - - 223
McEwen, Peter: *The clinical picture of thyrotoxicosis* - - - - - - 222
Mackenzie, Ian: *See* Mekie, Eric C., jt. auth.
McLaren, W.: *Modern trends in diagnostic radiology* (ed.) - - - - 221
Mair, George B.: *The surgery of abdominal hernia* - - - - - - 223
Malan, E., and Enria, G.: *Terapia endoarteriosa* 111
Mallet-Guy, Pierre, Jeanjean, Rene, and Marion, Pierre: *La chirurgie biliaire* - - 110
Marion, Pierre: *See* Mallet-Guy, Pierre, jt. auth.
Matson, Donald D.: *The treatment of acute compound injuries of the spinal cord due to missiles* - - - - - - 442
Mekie, Eric C., and Mackenzie, Ian: *Handbook of surgery* - - - - - - 443
Meleney, Frank Lamont: *Treatise on surgical infections* - - - - - - 333
Minnitt, R. J., and Gillies, John: *Textbook of anæsthetics* - - - - - - 222
Mitchiner, Philip H.: *See* Romanis, W. H. C., jt. auth.
Murphy, Douglas P.: *Congenital malformations* - - - - - - 221
Mushin, William W.: *Anæsthesia for the poor risk* - - - - - - 442
Ortolani, Marino: *La lussazione congenita dell 'anca* - - - - - - 106
Patel, J.: *Nouveau précis de pathologie chirurgicale* (ed.) - - - - 107, 444
Paterson, Ralston: *The treatment of malignant disease by radium and X-rays* - - 105
Poynter, F. N. L.: *The selected writings of William Clowes* (ed.) - - - 444
Romanis, W. H. C., and Mitchiner, Philip H.: *The science and practice of surgery* - - 223
Ross, J. Paterson: *See* Carling, Sir Ernest Rock, jt. ed.

PAGE

Reviews of Books (Authors), *continued.*
Seegers, Walter H., and Sharp, Elwood A.: *Hæmostatic agents* - - - - 443
Sénèque, J.: *See* Chinay, De M., jt. auth.
Shands, Alfred Rives, jun.: *Handbook of orthopædic surgery* - - - - 448
Sharber, Trimble: *See* Eve, Duncan, jun., jt. auth.
Sharp, Elwood A.: *See* Seegers, Walter H., jt. auth.
Skoog, Tond: *Dupuytren's contraction* - 222
Smith, Rodney: *Acute intestinal obstruction* - 222
Souttar, H. S.: *Physics and the surgeon* - 442
Stevenson, Lloyd: *Sir Frederick Banting* - 109
Thorsén, Gunnar: *Neurological complications after spinal anæsthesia* - - - 111
Vasconcelos, Edmundo: *Ulcers of the stomach and duodenum* - - - - 109
Watson, Leigh F.: *Hernia* - - - 221
White, Benjamin V., and Geschickter, Charles F.: *Diagnosis in daily practice* - - 220
Winsbury-White, H. P.: *Textbook of genito-urinary surgery* (ed.) - - - 332
Woerdeman, M. W.: *Atlas of human anatomy, descriptive and regional* - - - 442
RHIND, J. A., and WRIGHT, C. J. E.: Mesothelioma of the peritoneum - - - - 359
RIDDEL, VICTOR: Radical mastectomy - - 113
Riedel's thyroiditis, lymphadenoid goitre and 46
ROANTREE, W. B.: Spontaneous paralytic ileus - 352
ROBB, DOUGLAS: Pulmonary resection for metastatic malignancy - - - - 200
ROBERTSON, D. J.: *See* KINMONTH, J. B., jt. auth.
ROGERS, LAMBERT: Meningiomas in Pharaoh's people - - - - - 423
— — Pott's puffy tumour - - - 315
ROUALLE, H. L. M.: The solitary thyroid nodule and thyrotoxicosis - - - - 312
Rupture of bulbous urethra - - - 369
— penile urethra - - - - - 368
— prostato-membranous urethra - - - 370
— quadriceps - - - - - 94
— spontaneous, of splenic artery - - - 203
— subcutaneous, of abdominal muscles, case report 434
— and suture of femoral vein - - - 97

SACRALIZATION of L.5 in disk lesions - - 236
Sacro-iliac arthritis observed radiographically - 236
St. Agatha, patron saint of fertility - - - 114
St. Mark's Hospital, cancer of rectum statistics - 377
SANGSTER, A. H.: Chronic non-specific ulceration of cæcum, case report - - - 331
Sarcoma of bone, traumatic false aneurysm simulating 310
— peritoneum, case report - - - 432
Schmorl's nodes, radiography of - - - 235
SCHURR, PETER H.: Accessory urethral canal in the male - - - - - 181
Scoliosis, localized, in lumbar disk lesions - - 233
Sebaceous cyst, ulcerating, of forehead, case report - 103
Septum, anal intermuscular - - - 279
Sex incidence of argentaffinoma of gastro-intestinal tract - - - - - 130
— — carcinoma of œsophagus - - - 70
— — lymphadenoid goitre - - - 44
— — peptic ulcer in Nigeria - - - 61
— — post-operative pulmonary atelectasis - 260
SHEPHERD, W. H. T.: *See* TUTTON, G. K., jt. auth.
Sigmoid colon, hæmangioma of: case report - 210
SILVERSTONE, MAURICE: Persistent hæmaturia from a minute papilloma of the renal pelvis, case report - - - - - 438
Sinus, frontal, wounds of, tantalum plating of skull defects and - - - - - 37
Skin-graft, immediate, in radical mastectomy - 401

PAGE

Skin-grafting in total denudation of penis - - 268
Skull defects, traumatic, tantalum in repair of - 26
— lesions of, in Hodgkin's disease - - - 414
— localized osteitis fibrosa of, case report - - 211
SMITH, K. VINER: *See* CUNINGHAM, KATHLEEN, auth.
Sounds, Lister's, in repair of urethra - - 370
Spigelian hernia simulating acute appendicitis, case report - - - - - - 433
Spina bifida occulta, radiography and - - 236
Spinal deformity due to lumbar disk lesions 232 et seq.
Splenic artery, spontaneous rupture of - - 203
— flexure, cancer of, second primary cancer of colon (juxtacæcal) 20 years after, case report 218
Spontaneous herniation through transverse mesocolon - - - - - - 300
— massive intraperitoneal hæmorrhage - - 198
— paralytic ileus - - - - - 352
— rupture of splenic artery - - - 203
— ventral herniæ, case report - - - 317
Statistical assessment of herniorrhaphy - - 339
STEINER, R. E.: *See* JONES, CLIFFORD, jt. auth.
STENHOUSE, DAVID: *See* LESLIE, MARGARET, jt. auth.
STEPHEN, J. L.: Two cases of persistent jejunitis following partial gastrectomy, case report - 325
Stomach, carcinoma of, perforating into peritoneal cavity, case report - - - - - 435
— neurogenic tumours of - - - - - 139
— stricture of, coincidental with stricture of œsophagus, case report - - - - - 440
— volvulus of, in diaphragmatic hernia - - 58
Strangulation of ileum with bilharzia of appendix, case report - - - - - - 428
— of small intestine - - - - - 91
Strictures of œsophagus and stomach coincidentally, case report - - - - - - 440
Subdural abscess, thorotrast pyograms in - 254, 255
Subphrenic abscess - - - - - 185
Supernumerary kidney - - - 391, 392
Suprapubic drainage in rupture of urethra 364 et seq.
Syndrome, Paget-Schroffer - - - 155
Syringe, Cole's - - - - - - 349
— Pyrex, for injections in angioma - - 350

TANTALUM in repair of traumatic skull defects - 26
TAYLOR, HERMON: Further report on the operation of œsophagectomy with presternal œsophago-gastrostomy - - - - 419
TEMPLE, LESLIE J.: A case of gastric neurinoma with hæmatemesis, case report - - 430
Temporal abscess, thorotrast pyograms in - - 250
Testicle, interstitial-cell tumours of - - 81
THOMAS, EDGAR W.: A case of osteitis fibrosa cystica 306
THOMSON, G. RUSSELL: Complete congenital absence of the vagina associated with bilateral herniæ of uterus, tubes, and ovaries, case report - - - - - - 99
Thorotrast pyograms in cerebral abscess - - 240
Thrombo-angiitis obliterans - - 288, 291
Thymolipoma - - - - - - 311
Thymoma - - - - - - 271
Thymus, removal of, in myasthenia gravis - - 381
Thyroid nodule, solitary, and thyrotoxicosis - 312
Thyroiditis, Riedel's lymphadenoid goitre and - 46
Thyrotoxicosis, solitary thyroid nodule and - - 312
Tibialis anticus muscle, hernia of, in athletes - 405
Transverse colon, localized diverticulitis in - - 319
— mesocolon, spontaneous herniation through - 300
Trauma, simultaneous, of rectum and ureter, case report - - - - - - 219
Traumatic false aneurysm simulating bone sarcoma 310
— injuries of urethra due to missiles - - 364
Tuberculosis, foam-cell granuloma in chronic pyonephrosis simulating - - - 316

PAGE

Tumour(s), carcinoid, of small intestine with secondary deposits in various organs, case report - - - - - - 215
— embolus, sudden death at operation due to, case report - - - - - 429
— of forearm, gross hypertrophy of palmaris longus muscle simulating, case report - - 213
— head in Hodgkin's disease - - - 414
— interstitial-cell, of testicle - - - 81
— neurogenic, of stomach - - - 139
— Pott's puffy - - - - - 315
TUTTON, G. K., and SHEPHERD, W. H. T.: Thorotrast pyograms in cerebral abscess - - 240

ULCER, peptic, in Nigeria, study of - - 60
Ulceration, chronic non-specific, of cæcum, case report - - - - - - 331
— of groin in Hodgkin's disease - - - 414
Ulcerative colitis, histopathology of semisquamous epithelial layer - - - - 84
Ureter, bilharzial - - - - - 148
— ectopic, urinary incontinence due to - - 391
— fistula into rectum - - - - 175
— implantation of secondaries from renal carcinoma - - - - - 164
— and rectum, simultaneous injury of, case report 219
Urethra, fistula into rectum - - - 175
— missile injuries of - - - - 364
Urethral canal, accessory, in male - - - 181
Urinary incontinence due to ectopic ureter - - 391
— tract and rectum, fistula between - - 175
Urine, extravasation of, in urethral injuries - - 367
Uterus, tubes, and ovaries, bilateral herniæ of, with congenital absence of vagina, case report - 99

VAGINA, congenital absence of, associated with bilateral herniæ of uterus, tubes, and ovaries, case report - - - - - - 99
Vagus nerve, neurinoma of, in neck, case report - 101
Varicose veins, injection treatment of - - 294
Vas deferens, bilateral aplasia of - - - 417
Vein, femoral, rupture and suture of - - 97
Venous obstruction in upper extremity - - 155
Ventral hernia, spontaneous, case report - - 327
Vertebral changes due to lumbar disk lesions 232 et seq.
Volvulus of stomach in diaphragmatic hernia - 58
Vomiting in peptic ulcer cases in Nigeria - - 62
Von Recklinghausen's disease, neurofibroma of stomach associated with - - - 143

WALKER, A. J.: Cæcal fæcolith - - 55
WATERFALL, W. B.: Perforated jejunal diverticulum, case report - - - 214
WELLS, CHARLES: Rupture and suture of femoral vein - - - - - 97
— — and ANNIS, DAVID: Immediate skin-graft in radical mastectomy - - - 401
WIGGLESWORTH, G. F.: *See* BENNETT-JONES, M. J., jt. auth.
WILDE, F. ROLAND: The anal intermuscular septum 279
WILLIAMS, I. G.: Carcinoma of the rectum and anal canal—treatment with very high voltage X-ray therapy - - - - 376
WRIGHT, C. J. E.: *See* RHIND, J. A., jt. auth. - 359
WRIGHTSON, PHILIP: Carcinoid tumour of the small intestine with secondary deposits in various organs, case report - - - 215
WYNDHAM, NORMAN: Fistula between the rectum and urinary tract - - - - 175

X-RAY investigation in injection treatment of varicose veins - - - - 294

YOUNG, DONALD: Bilateral aplasia of the vas deferens - - - - - 417

PRINTED IN GREAT BRITAIN BY JOHN WRIGHT AND SONS LTD., THE STONEBRIDGE PRESS, BRISTOL

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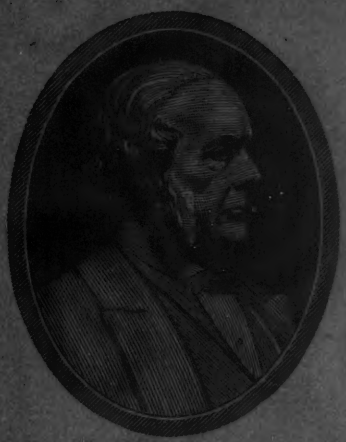

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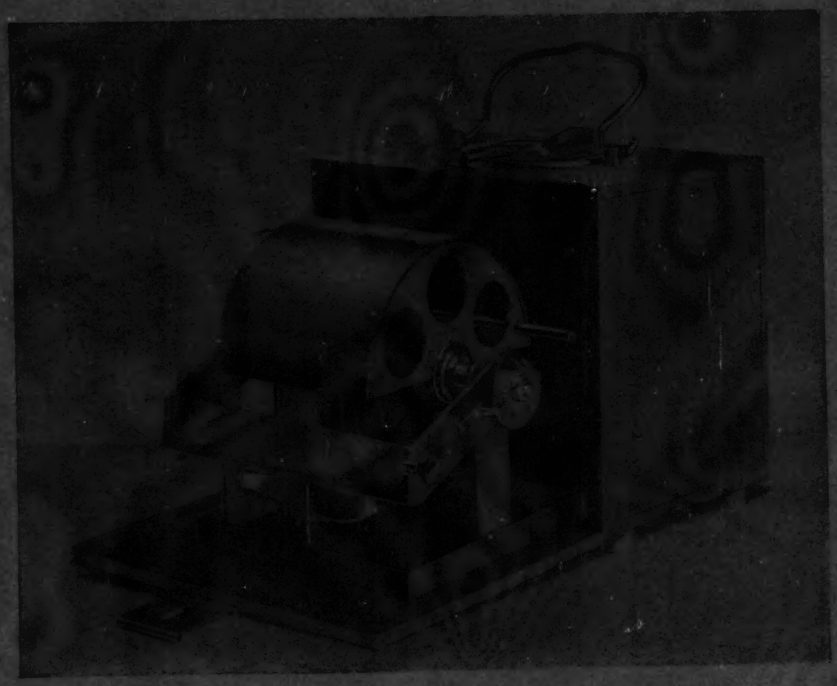

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